

terdam in 1891 and died at Oegstgeest near Leiden on 17 Dec. 1951. Obituary in *Oriente Moderno* (32, 56, 1952).

**RALPH STAYNER LILLIE (1875-1952).** Canadian biologist. Born in Toronto, on 8 August 1875, died in Chicago on 19 March 1952. He devoted many studies to the philosophical aspects of biology; some 25 of them were reviewed or listed in *Isis*. It must suffice to mention his book *General biology and philosophy of organism* (Chicago 1945; *Isis* 37, 259).

**ALEXANDER DUNLOP LINDSAY, LORD LINDSAY OF BIRKER (1879-1952).** English philosopher and educational administrator. Master of Balliol for 25 years, Vice-Chancellor of Oxford University, Principal of University College of North Staffordshire. Author of studies in Plato, Bergson, Karl Marx, Kant, etc. Died in March 1952 (*Isis* 35, 261).

**GIUSEPPE MESSINA, S.J. (1893-1951).** Italian student of Iranian religion and influences. Disciple of Josef Markwart. At the time of his death on 28 June 1951, he was professor of Iranian literature and religion and O. T. in the Pontificio Instituto Biblico, Rome. He was born at San Cataldo (Caltanissetta) on 6 Jan. 1893. Obituary in *Oriente Moderno* (31,

**MOHAMMED 'ALĪ (1875-1951).** Maulānā Moḥammed 'Alī. Born in 1875 at Murar, Kapurthala, died at Karachi, Pakistān on 17 Oct. 1951. He was president of the Ahmadiyya anjuman-i-ishaat-i-Islam in Lahore and director of the *Review of Religions*. He prepared an excellent edition of the Qur'ān with English translation and commentary (*Isis* 38, 243). Obituary in *Oriente moderno* (32, 41, 1932).

**SIR CHARLES SHERRINGTON, O.M. (1858-1952).** English neurophysiologist. Died on 5 March in Eastbourne. His main work *The integrative action of the nervous system* (1906) was reprinted in 1947 with a bibliography (*Isis* 39, 275). *Selected writings* (1939).

*Man on his nature* (1941; *Isis* 33, 544). *The endeavour of Jean Fernel* (1946; *Isis* 41, 212).

**WALTER TENNYSON SWINGLE (1871-1952).** American botanist and Sinologist. Born in Canaan, Pa. on 8 Jan. 1871; died in Washington D. C. on 19 Jan. 1952. He was a student of Chinese and Japanese agriculture and pharmacy and advised the Library of Congress in its acquisitions of oriental books. His Reports to the Librarian of Congress were often reviewed in *Isis* (e.g., 11, 509; 16, 535; 20, 584). See his paper, Our agricultural debt to Asia, in *The Asian Legacy* (p. 85-114, New York 1942; *Isis* 37, 235).

**GINO TESTI (1892-1951).** Italian historian of chemistry. Born in Catanzaro, 2 July 1892; died 19 June 1951. One of the last of his many publications was his *Dizionario di alchimia* (1950; *Horus* 166, 202).

**JAMES JOSEPH WALSH (1865-1942).** Physician, historian of medicine, and of Catholicism. Very prolific writer. His most popular books were *The Popes and science* (1908; 3rd ed. 1916). *The thirteenth, greatest of centuries* (1907, 10th ed. 1937). *History of medicine in New York* (5 vols., 1919; *Isis* 7, 320). *Medieval medicine* (1920; *Isis* 3, 308). *A golden treasury of medical literature* (1930; *Isis* 16, 527). *Edu-*

(1935; *Isis* 25, 173-74). He was born in Archbald, Pa., 1865; died 28 Feb. 1942. Brother of Joseph Walsh.

**JOSEPH WALSH (1870-1946).** American physician and historian of medicine. He was a tuberculosis specialist and wrote many books and papers on the subject. He was one of the founders of Henry Phipps Institute of Philadelphia, and of the Sanatorium at White Haven, Pa. He wrote an elaborate life of Galen published in the *Annals of Medical History* (1934 to 1939) but left unfinished. He was born at Parsons, Pa., near Wilkes-Barre. He died at his home in Philadelphia on 23 Oct. 1946, aet. 76. He was a brother of James Joseph Walsh.

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## Notes & Correspondence

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**The interpretation of Erich Frank by Santillana and Pitts.**—Allow me to make some comments on the article *Philolaos in Limbo, or What happened to the Pythagoreans?* by G. de Santillana and W. Pitts, published in *Isis*, 42, Part 2, No. 128, pp. 112-120. What I have to say is not concerned with the question of whether or not the authors are right in main-

taining, against the now commonly accepted view, that the fragments of Philolaos are genuine. I am concerned only with their attack on Erich Frank, whom they single out as the main representative of the theory which they reject. At the end of their article the authors call Frank "such a distinguished scholar and respected personality" (p. 119). I can not find

that in their article they have treated him with the respect that such a man would deserve, that indeed any scholar would deserve, and by this is simply meant that his work and his opinions should be described correctly and fairly.

I shall enumerate the most obvious misrepresentations in the order in which they occur in the article:

(1). Anaxagoras was the first to formulate the principle of modern science; he found the basis for this feat in the art of scenic perspective invented by Agatharchus (pp. 112 f.). The reader must get the impression that this is a hypothesis of Frank's. Actually he is interpreting a statement of Vitruvius (59 A39 Diels), who says that Democritus' and Anaxagoras' investigations started from Agatharchus' work. Nor does Frank claim that Agatharchus "invented" scenic perspective. Very much like the *Oxford Classical Dictionary*, quoted by Santillana and Pitts, p. 113, n. 3, to refute him, Frank says that Agatharchus was the first to have painted a perspective stage setting (p. 19); in his time, the Greek painters learned "consciously" to use perspective in their drawings (p. 20). If the authors think that Frank "does not make his point more perspicuous" by reference to Aeschylus' plastic personalities, they might find it helpful to consider the parallel relation between painting and mathematics in the Renaissance, referred to by Frank on p. 22.

(2). In order to prove his thesis, Frank "has to throw out most of the available evidence and stand the rest of it on its head" (p. 113). As footnote 4 adds, "one example will suffice for the way Frank handles texts." In regard to this example—"he says (p. 286 [obviously p. 268 is meant]) that we know from Aristotle's *Metaphysics* that the correspondence of 2 with the unlimited is strictly Platonic, whereas the Pythagoreans made the monad unlimited"—it will suffice to point out that Frank's interpretation of the Platonic concept of *Einheit* and *Zweiheit* and of the difference of this concept from the Pythagorean one is based on Aristotle, *Metaphysics*, 987 b 25, *Physics*, 203 a 15, and *Fragments* 28 and 47 Rose; cf. also Frank, p. 260, n. 1. As for "throwing out the evidence," see below, (7).

(3). Frank's account "with its heavily Spenglerian point of view" (p. 113; cf. p. 114): in fact Frank's concept of Greek mathematics is diametrically opposed to that of Spengler, and besides, he wrote one of the most scathing criticisms of Spengler's book shortly after it appeared (cf. *Logos*, IX, 1920/2, 2, pp. 222-59).

(4). No one before Democritus was capable of the operations of analysis and synthesis. This "is a result of something he [sc. Frank] calls the 'Archaic Atmosphere' of the fifth century, which compelled people to live in a state of confusion" (p. 113). No reference is given. Where Frank speaks of Democritus' analysis and synthesis (p. 81), the archaic atmosphere is

not mentioned. It occurs nine pages earlier (p. 72), where it is stated that the so-called Pythagorean philosophy is unthinkable in the "archaic atmosphere of the sixth (!) century"; and surely it did not "blow away" in the 4th century (*Isis*, p. 113), for according to Frank (p. 83), rational and demonstrative science began with Anaxagoras and Democritus. Let me add immediately that the concept of "Archaic Atmosphere" is *not* one of the two "major devices" introduced by Frank, in order to make his point (*Isis*, p. 115). I am not aware of such a use of this concept, and the authors fail to give any reference.

(5). Democritus together with Anaxagoras "invented" mathematics (p. 114). Since the authors apparently are unable to exhaust "the list of Frank's extraordinary notions" (p. 119), they prefer to stop at the reflection that, according to Frank (pp. 64-66), Democritus was the last man who can be said to have encompassed the whole knowledge of his epoch; for since the beginning of the 5th century or even earlier, "there was a body of special sciences with which philosophers were soon unable to keep up. . . . If Frank is willing to admit all this freely, one wonders what all the shooting was about" (p. 119). Those familiar with Frank's book will hardly "wonder." In Frank's opinion, mathematical knowledge before Democritus' time was indeed considerable (pp. 79 f.). But mathematics was not "systematic," it was knowledge of the "That," rather than of the "Why." And it is systematic, and consequently apodictic, mathematics, that was "invented" by Democritus and men of his generation (p. 81). Incidentally, although Eudemos does not mention Democritus among the mathematical writers (*Isis*, p. 114), it is undeniable that other ancient authorities mention his mathematical works, and it is, after all, on these testimonies, and not on Eudemos, that Frank bases his reconstruction of Democritus' role in the history of mathematics.

(6). The other main "device" which Frank uses, in addition to speaking of the "Archaic Atmosphere" (cf. above, 4), is the "trick" of considering historical figures simply as characters in dialogues written by Speusippus and Heraclides (p. 115). As I said at the beginning, I am not concerned with the correctness of Frank's interpretation. But certainly the authors are not justified in charging that such a "device" is used by Frank, because he wishes "to ascribe the discovery (of *A*) to some other later man *B*." It is an incontrovertible fact, recognized long before Frank, that in the dialogues of Plato, Aristotle and their pupils, theories are ascribed to the interlocutors which they must not necessarily have held, for these dialogues are, in part at least, poetic fiction. The question is, how far one can still distinguish truth from fiction. Nor can anyone doubt that Aristotle's remarks on philosophy are a far cry from a critical history of

philosophy in the modern sense, and this is all that Frank claims in the passage to which the authors take exception (p. 76).

(7). "In order to prove his main contention . . . he has to eradicate Philolaos from history . . . to inject wild confusion into a . . . chapter of the history of Greek astronomy and to subvert the few reliable bearings we had gained in it. Since the technical historians have not proved willing to follow him in his adventure, we may be excused from undertaking an elaborate refutation" (p. 116). But note 8 contains at least a short refutation:

(a). "What Frank does is to disregard (not even mentioning it) the . . . work . . . of Schiaparelli and Heath." A quick glance at the footnotes of Frank's book shows that Schiaparelli at any rate is extensively quoted (e.g. pp. 336; 343 f.); even one of his drawings is reproduced (p. 343, fig. 18).

(b). "He tortures three obscure but innocent lines of Aristotle, Chalcidius and Geminus until he has wrung from them a suggestion. . . ." Do the authors mean to say Frank is wrong? Or is he right in his interpretation?

(c). The Eudoxian system — "which was the last word until 360." It is objected that Eudoxus published his system in 357. Frank actually says that the Eudoxian system was the last word probably until 350 (p. 208).

(d). Contrary to Frank's assertion, "Plato never adopted any moving-earth system." The implication is that Frank was wrong in his interpretation of the *Timaëus*. As a matter of fact, Frank too is of the opinion that Plato in the *Timaëus* did not accept a moving-earth system (pp. 35; 205-7). He concludes from Theophrastus (cf. also Plato's *Critias*) that Plato in his old age changed his mind (p. 207).

(e). Frank's theory "requests us to throw out all of the explicit testimonials, which are many." It requests us to decide, whether the testimonies have been interpreted correctly by Frank (cf. pp. 207-217; 263-335).

(8). The authors do not intend to give a point by point re-examination of the case, but "some remarks on Frank's all-too-general method seem in order" (p. 116). Whenever a word or an idea can also be found in Plato, it must have been taken from Plato. Frank is sure that nobody before Plato used such words as *eidos*, *morphē*, *usia*. This would indeed be "pernicious nonsense a priori" (p. 117). Of course, Frank does not hold such a view. He considers certain key words in the fragments of Philolaos as taken from Plato and indeed Platonic. In order to show that others may also have been taken from Platonic texts, he points out that *eidos* and *morphē* in a philosophical meaning are terms familiar to everybody from Plato (p. 307, n. 1). It would indeed not be "serious" to say "that there is no idea of a *hēgemonikon cybernētes* (?) of the world before Plato invented it" (*Isis*, p. 117). Frank only says that the expression *hēgemonikon* too is

identical with one of Plato's terms (p. 286f.; again I have to supply the references).

(9). "A note of comic relief is brought in when B 13, where the *aidoion* is said to be 'the source of all things', is declared to be obviously derived from Plato's theory of the Cosmic Soul. Professor Frank seems to have been unacquainted with some very ancient facts of life, as well as with the fundamentals of Presocratic thought" (p. 118). Where to my knowledge Fr. 13 of Philolaos is discussed (pp. 320 f.; 323 f.), I can find only that the terms used in the description of the process of generation are identical with those used by Plato and Aristotle, and that Philolaos' theory of life in the universe is identical with that of Plato (p. 285).

The examples I have given — more could be added! — are sufficient, I think, to prove my contention that the authors have not given a fair picture of Frank's views. Could Frank still speak for himself, I should not have had to defend his work against misrepresentation. The memory of his personal and intellectual integrity and of his serious devotion to scholarship makes it imperative for me to counter this unwarranted attack.

LUDWIG EDELSTEIN

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We thank Dr Edelstein for some corrections. Also for giving us the opportunity to restate our intention, which certainly was not to attack the memory of Erich Frank, whom we have known not only as a distinguished scholar, but also as a lovable and selfless person. We were concerned with a trend started by his book, which appeared to us dangerous. In such cases, *magis amica veritas*.

To take up the points one after the other:

(1-3). We are sent back to Vitruvius as the authority. Very well; here is Vitruvius:

Primum Agatharchus Athenis Aeschilo docente tragaediam scaenam fecit et de ea commentarium reliquit. Ex eo moniti Democritus et Anaxagoras de eadem re scripserunt, quemadmodum oporteat ad aciem oculorum radorumque extensionem certo loco centro constituto lineas ratione naturali respondere, uti de incerta re certae imagines aedificiorum in scaenarum picturis redderent speciem et quae in directis planisque frontibus sint figurata alia abscedentia alia prominentia esse videantur.

This passage states that the two men were prompted by the artist's attempt to write on perspective. That is all. When Frank interprets this (and this alone) to mean: "Anaxagoras was the first to formulate the principle of modern science, by distinguishing the subjective-psychological world-image in his psychological investigation from the objective vision of an ideal and absolute observer," the "interpretation" is so remote from the text as to be not only an hypothesis but an extremely shaky one.

The idea of "conscious plasticity" or "plastic consciousness" or anything like that can only bring confusion in these matters. We cannot

quote the whole page-long passage on p. 19–20, but here is a sentence from it: “Die plastische Kraft des Lebens macht, das sich in unserem Bewusstsein von der Welt zugleich auch unser Inneres widerspiegelt.” Intuitively and aesthetically, it is one of those ample statements which elicit approval. But does it really mean, as the text goes on immediately, that Anaxagoras and Democritus had to be inspired by Agatharchus in order to found mathematical science? What does it tell us about Anaxagoras’ scientific position? As little as the other statement about the Dionysiac urge toward the infinite. These concepts and terminology, incidentally, are what we called the Spenglerian element. We never meant to imply that Frank was a follower of Spengler’s system. Of course Spengler would not have said that Hellenes were addicted to Dionysiac ecstasies about the infinite, even in the sixth century. That notion would, rather, be Nietzschean, but we were trying to indicate a certain *Ideenkreis*.

We do not see how any relation between painting and mathematics, resulting from the painter’s need for geometrical optics, can be helpful in understanding an alleged relation between geometry and the treatment of character in tragedies. Nor does the reference to p. 22 clarify the matter. If the somewhat vague phrase there does not mean to assert a direct and important influence of books on perspective on Galileo’s and Benedetti’s inventive thought, there is no parallel. If it does assert such an influence, it is simply mistaken.

(4). What we call the “device of the Archaic Atmosphere” does not specifically refer to the mention on p. 72 (and if we slipped up on that quotation we regret it). The device consists, e.g., in denying people any capacity to think or imagine coherently in spatial terms before “stereometry” had been invented, late in the Fifth Century. In fact, the passage on p. 81 to which we are referred is a perfect case of the device. The quotation from Aristotle (2nd *Anal.* I. 13) is made to imply that there was a body of scientific optics before geometry, of mechanics before stereometry (is this where Frank got the idea?), of harmony before arithmetic; this in turn leads to the idea that “element,” “system,” etc., appear only at the time of Democritus. And this leads Frank into untenable theories concerning the atomistic element in the Pythagoreans.

(5). We agree entirely with Dr Edelstein and Frank about the importance of Democritus as a mathematician. We do not believe that men left out of an abridgment of Eudemus are not great mathematicians, but that people who are mentioned there probably are.

As for the statement we quoted in conclusion, we did so because we felt we could agree with it, although it did not sound quite consistent with the rest. Does anyone want Frank to be entirely consistent on this? Very well. On p. 64, he says there was a whole library on each

science in the Fifth Century. We are told now that it dealt strictly with the “that” not the “why.” If we adopt Dr Edelstein’s interpretation, Anaxagoras and Democritus, before creating mathematics, must have had to cope with a whole library of isolated and independent mathematical theorems in the nature of practical recipes (the “that”). If they were not found by inference from one another, how were they discovered? By generations of people with drafting instruments, micrometers and statistical methods? Is that what Frank means by *Einzelwissenschaften*? And if he does not, what can he mean? One can choose between making Frank inconsistent or making him palpably absurd. Dr Edelstein’s interpretation is probably more authoritative than ours.

(6). We do not deny the possibility of an author’s being a mere character in a dialogue and his opinions being what he is made to say there. But a hypothesis of this kind requires almost incontrovertible evidence in its favor. Otherwise it can be used far too easily to dispose of any facts, however well established, which are inconvenient to any theory one may happen to hold. We do not believe that Frank provides such evidence.

(7). a. Schiaparelli is quoted once, but only casually and about something quite different, namely Eudoxus. What we were saying is that the reconstruction of Heraclides and his group, on which Frank’s main contention rests, takes into no account his other great work, *I precursori di Copernico nell’ antichità*.

b. We mean Frank was wrong.

c, and d. Correction accepted. It should have been 350. We implied nothing about the *Timaeus*. Besides, we were not accusing Frank of ignoring what has been found out only later. The correction in no way affects our argument.

e. Sufficiently distorted interpretation of evidence is equivalent to throwing it out.

(8) and (9). This would take pages. Also the index to Frank is so defective that it would take days to hunt up the material. We beg to refer the critic to the ample discussion by Mondolfo that we have quoted in note 10. We give one point as an example: It is perfectly true that Frank only says of *eidōs* and *morphē* that they are familiar to everyone from Plato. But that statement is made as a negative answer to the immediately preceding question: “What remains then still in this Fr. B 2 that can be described as old-fashioned and pre-Platonic?” with the implication that on that account they *can* not be so.

If Dr Edelstein wants more “extraordinary notions,” he will find a whole package of them in pages 59 to 64, from which we extracted one statement that we could agree with. It was meant to show that we were not arguing against the man. We are glad we can make this clear again. It has happened to many great scholars to be spell-bound by a wrong thesis and to be

lured by it into the quagmires of sophistry. We expect forgiveness from the gentle shade of Erich Frank; for our endeavor was not to run him down, but to protect other greater shades of the distant past—the very men who created our way of thinking—and to prevent their memory from being buried under the mounds of hypercriticism.

GIORGIO DE SANTILLANA  
WALTER PITTS

Mass. Institute of Technology

**Newton and the Theory of Chemical Solution.**—Mr Kuhn (*Isis*, 42, 296–8) brings up a problem of great interest in his discussion of Newton's views of the action of such "menstrua" as aqua fortis and aqua regia on gold and silver. In the 31st Query of the *Opticks* Newton inquired:<sup>1</sup>

When *Aqua fortis* dissolves Silver and not Gold, and *Aqua regia* dissolves Gold and not Silver, may it not be said that *Aqua fortis* is subtle enough to penetrate Gold as well as Silver, but wants the attractive Force to give it Entrance; and that *Aqua regia* is subtle enough to penetrate Silver as well as Gold, but wants the attractive Force to give it Entrance?

Mr Kuhn points out that the last clause appears to conflict with the metallic replacement series for *aqua fortis* given just prior to this passage, and ingeniously suggests a printer's error. Since this passage is followed by one in which Newton remarks on the "grossness" of the salt which converts aqua fortis to aqua regia, Mr Kuhn believes that this reference to the size of the particles gives the clue, and that we should assume that Newton meant to state that aqua regia failed to dissolve silver because its particles were too large to penetrate the pores of silver. The following considerations tempt me to question this proposal in part, though the passage as printed certainly chimes oddly on the ear.

What is involved is a theory of chemical solution, a problem beset with difficulties for seventeenth and early eighteenth century chemistry. Most mechanically minded chemists believed that chemical solution involved physical union, so that the relative sizes of the particles of the menstruum and the pores of the solute were of critical importance in determining solubility. Thus Boyle, avoiding all "occult" forces, made solubility dependent on the size and shape of the particles of the menstruum relative to the pores of the metal; while a Newtonian like John Freind anticipated the Newton of the *Opticks* with an elaborate dynamical theory involving size, attraction and velocity of the particles.<sup>2</sup>

<sup>1</sup> *Opticks*, 3rd edition, London, 1721, p. 357–8.

<sup>2</sup> Boyle: *The Mechanical Origin of Corrosiveness and Corrosibility*; *Works* (ed. T. Birch, 1772 edition) IV, 314–28; and elsewhere

But the fact that Newton regarded size as critical does not mean that he could have explained the failure of *aqua regia* to dissolve silver by assuming that its particles were too large to enter the pores of silver when they were small enough to enter the pores of gold. Like most corpuscularians of his day he thought that the size of the pores of a substance was a measure of its density,<sup>3</sup> so that silver had larger pores than gold and a particle small enough to penetrate gold must be physically capable of penetrating silver, other things being equal.

In corroboration of the version printed is the following passage from Newton's letter to Boyle of February 28, 1678/9:<sup>4</sup>

When any metal is put into common water, the water cannot enter into its pores to act on it and dissolve it: not that water consists of too gross parts for this purpose, but because it is unsociable to metal: for there is a certain secret principle in nature, by which liquors are sociable to some things, and unsociable to others. . . . so *aqua fortis* dissolves silver, not gold; *aqua regia* gold, not silver, etc.

Here Newton clearly thought that *aqua regia* had an attractive force for gold and not for silver; and this passage may reasonably be used to gloss the statement in the 31st Query. It is true that just prior to this, Newton listed a metalline replacement series in which, as Mr Kuhn reasonably deduces, gold would be lower (i.e. less attractive to the solvent) than silver; but this is a series for *aqua fortis*. I do not believe that we are justified in assuming that this series was meant to be applicable to all acids, but rather that each acid had, for Newton, a different relative attractive force for the various metals. At the same time it would always be easier for an acid to dissolve copper or iron than gold because the very small size of the pores of gold—pores which became ever smaller as the particles of the "first composition" were approached—would mean that many acids with sufficient attractive force to form a union with gold would be frustrated by the large size of their particles.

MARIE BOAS

University of Massachusetts

I am indebted to Dr Boas for her cogent comments on my paper, "Newton's 31st Query and the Degradation of Gold." Her criticisms are clearly relevant, and their substance must be incorporated in any reconstruction more final than mine purports to be. But I doubt that the evidence she adds is adequate either to eliminate the problem inherent in Newton's text or to set aside my speculative solution.

*passim*. John Freind: *Chymical Lectures*, London, 1712 (read 1704), 95–102.

<sup>3</sup> See especially *Opticks*, Book II, Part III, Prop. VIII, p. 242.

<sup>4</sup> S. Horsley: *Isaaci Newtoni opera quae exstant omnia*, London, 1782, IV, 389–91; also printed by Birch in his life of Boyle.

Dr Boas's courteous rejection of my problem and hypothesis may prove to be correct; I still find the problem real and the sum of the evidence inconclusive.

Newton, as a corpuscularian, was certainly committed to the view that since gold is denser than silver the *total* volume of the pores in a given sample of gold is less than that in an equal volume of silver. But this need not imply that the space between the "particulas ultimae compositionis"<sup>1</sup> (the only particles which need be separated in *dissolutions*) is smaller in the denser metal; the increase in density can be achieved by a closer packing of the "particulas primae and secundae compositionis." Thus a *menstruum* whose particles are too gross to enter silver at all might still enter the denser metal gold. Such particles would cause *dissolution* of the gold; they would be incapable only of producing *fermentation* for which a penetration of the particularly densely packed "particulas primae and secundae compositionis" is required. Newton does seem to employ the great density of gold implicitly in arguing that gold can never be fermented. This argument does not conflict with his observations that gold can be *dissolved*, and that the most effective agents in such dissolutions are those (e.g., *aqua regia* and "prepared" mercury) consisting of particularly gross particles.

The passage quoted by Dr Boas from Newton's letter to Boyle certainly conflicts with my reconstruction of Newton's mechanism for the selective affinities of *aqua fortis* and *aqua regia*. But with what assurance can the letter be employed to gloss the "31st Query"? Written thirty-eight years before the publication of the "Query," the letter is devoted to the tentative elucidation of the role of the *aether* in a variety of natural phenomena many of which Newton later explained by other means. The letter conflicts repeatedly with undisputed portions of the text of the "Query;" the "secret principle" of the letter is not immediately identifiable with the forces between particles later employed by Newton in the "Queries." So the letter itself provides no categoric gloss.

Dr Boas correctly criticizes my unqualified extension of the replacement series to *aqua regia*. There is nothing explicit in Newton's text<sup>2</sup> permitting an extension to "all acids." But there is ample evidence in the text that, though Newton employed *aqua fortis* in deriving the series, he did not envisage the series as applicable to but a single solvent. He begins the discussion by suggesting that particles of salt of tartar attract the particles of *any acid* more strongly than these are attracted by the particles of any metal, and he closes by asking whether the series for the relative attractive

forces of the particles of the various metals may not explain why "of all metals, iron is dissolved most easily, and is most apt to rust, and next after iron, copper?" Dr Boas appears to interpret the last remark as a reference to the relatively large pores of iron and copper. But the remark is an application of the replacement series, and the series is concerned only with the relative forces of attraction between various particles; the effects of pore-size do not enter. Therefore I still doubt that the author of the replacement series could posit that the addition of salt to *aqua fortis*, whose unmodified corpuscles attract those of silver more strongly than gold, would produce a *menstruum* whose particles attract those of gold more strongly than silver.

THOMAS S. KUHN

Harvard University

**The first book on naval medicine.**—As always, I read *Isis* No. 130 from front cover to back cover. Your remark on p. 333, left column (review of *Roddis*, James Lind) struck my eye. You say:

"The first book on naval medicine in English (and perhaps in any language) is the "Cures of the diseased. . . (London 1598)." This statement may be correct as far as *English* medical literature is concerned. However, there is a considerably older book in German which probably deserves to be called *Medicina Nautica Number One*:

Pictorius (Georg), *Raiss Büchlin*. Ordnung wie sich zu halten, so einer raisen will in weite und onerfarne land, Unnd wie man allen zufällen, so dem raisenden zustehn mögen, mit guoten mitteln der artzney begegenen soll. Mit angehencktem regiment, wie sich auff dem Möre, oder andern Wassern zu schicken. (s. l., but probably Strassburg or Augsburg) 1557.

The title reads in translation:

Handbook for Travellers. What is to be observed by one who wants to travel into remote and unknown Lands. Also, how one has to use good Remedies of medicine in all Accidents which may befall the Traveller. With a supplement on how to behave at Sea or other Waters.

This Pictorius (c. 1500–1569) was an extensive writer on medical subjects and he wrote one of the earliest books on kidney diseases (*Grien Büchlin* 1557) English translation (London 1925). Unfortunately, he wrote also one of the meanest books against the admission of Jewish physicians, *Von zernichten Ärzten* (Strassburg 1557).

HERBERT REICHNER

New York 21

**The Date of Birth of Thomas Digges.**—Dr Francis R. Johnson in *The Times Literary Supplement* (London), 5 April 1934, dated the birth of Thomas Digges more precisely than my note in *Isis* 42: 120–121, June 1951; I feel

<sup>1</sup> All quotations and references in this paragraph are to the portion of *De natura acidorum* quoted in my original paper, *Isis*, 42, p. 298.

<sup>2</sup> S. Horsley, *Isaac Newtoni opera* (London: 1782), vol. IV, p. 246.

that readers of Isis should be referred to Dr Johnson's prior statement on that subject. Dr Johnson determined that Digges was born in 1545 or 1546, about four or five years earlier than I thought probable. He cited as evidence Digges' own statement at the end of Part I of the *Pantometria* (1571), and a similar statement discovered by Sanford V. Larkey in a Digges manuscript [MS Lansdowne 67 (5) f. 9]. This dating of Thomas Digges' birth means that Leonard Digges must have died very shortly after his return to England at the accession of Queen Elizabeth.

May I add to my gleanings from the sources the following references to more extensive studies of the same subject:

Johnson, Francis R. and Larkey, Sanford V., "Thomas Digges, the Copernican System, and the Idea of the infinity of the Universe," *Huntington Library Bulletin*, no 5, April 1934.

Johnson, Francis R., *Astronomical Thought in Renaissance England*, Baltimore, 1937.

LOUISE PATTERSON

#### The date of birth of Lionardo da Vinci.—

In the collection of documents concerning Lionardo's life and works very well edited by Luca Beltrami (Milano 1919; *Isis* 3, 457; 40, 354), there was no certificate of birth of Lionardo, and the only documents from which the year of his birth could be deduced were two notarial ones dated 1457 and 1469 wherein "Lionardo son of the said Ser Piero, non legitimate" is stated to be 5 years and 17 years old (Beltrami, nos. 2-3). Hence, Lionardo was born c. 1452. In the first of these documents (dated 1457), Lionardo is said to be "the son of Ser Piero and of the Charterina, now donna d'Achattabriga di Piero del Vaccha da Vinci."

Many years after the publication of Beltrami's book, a new document was discovered by Emil Möller in the notarial archives of Florence. It is a collection of family memoranda written in his own hand by Ser Piero's father, Antonio (born c. 1371, died c. 1464, aet. 93/94). It was published by Möller under the title "Der Geburtstag des Lionardo da Vinci" in the *Jahrbuch der preussischen Kunstsammlungen* (vol. 60, 71-75, Berlin 1939) with facsimile. I translate the last section:

1452

There was born to me a grandson, son of my son Ser Piero, Saturday 15 April, at 3 o'clock of the night. He was given the name Lionardo. He was baptized by the priest Piero di Bartolomeo da Vinci, Papino di Nanni Banti, Meo di Tonino, Piero di Malvolto, Nanni di Venzo, Arrigo di Giovanni Tedesco, Monna Lisa di Domenico di Brettone, Monna Antonia di Giuliano, Monna Nicolosa del Barna, Monna Maria, daughter of Nanni di Venzo, Monna Pippa di Previchone.

He was baptized by the priest, the ten other people named are those of godparents and wit-

nesses, ten in all, five men and five women; an unusually large number.

The day was the first Saturday after Easter 1452; the hour 3rd of the night must be taken to mean on that day 22:30.

The document, written in a clear hand by the grandfather Antonio, who was then 81 years old, shows that the name of the child was Lionardo (the Tuscan form of Leonardo). Note that in this document the child's mother is not named, though Antonio himself had named her in the document of 1457, above-mentioned.

Lionardo was not born in Villa di Anchiano, but in a house on the southern slope of the Borgo di Vinci; probably the house which Antonio had owned since 1431. He was baptized on the following Sunday in the little church of Santa Croce in Albis.

I am very grateful to my friend, Prof. Dott. Arturo Castiglioni, for having given me the means of tracing these facts in his kind letter dated Milano 18 March 1952.

Final Remark. The date Saturday 15 April is, of course, a Julian date; the corresponding date in our calendar is Saturday, 24 April. It was only on 24 April 1952 that five hundred years had elapsed since Lionardo's birthday.

GEORGE SARTON

Professor **James R. Naiden**, University of Washington, Seattle, is compiling a roster of scholars working on the neo-Latin authors of the 15th to the 19th centuries. As this literature was directed towards the cultivated public of Western Europe generally, its content frequently enters into the field of the history of culture, very often into the history of the formulation and dissemination of scientific theories.

Scholars active in this branch of study are asked to communicate with Professor Naiden, sending him, besides details of address and affiliation, indication of their field of interest within the larger area, the writers on whom they are working, and bibliographical references for their publications in the field.

When the roster is completed, a copy of the list will be sent to all participants.

#### Contributions of the history of science to the understanding of literary change.—

At its annual meeting held in Detroit, the Modern Language Association devoted a conference to the history of science (18 Dec.). It was led by **Harcourt Brown** of Brown University, President of the History of Science Society, and papers were read by **Philip A. Wadsworth** (Northwestern University), **J. Kester Svendsen** (University of Oklahoma), **Margaret Denny** (University of Rochester), **Roy R. Male, Jr** (Texas Technological College), **George R. Potter** (University of California [Berkeley]), **Charles M. Coffin** (Kenyon College) and **Norbert Fuerst** (Indiana University).

**"Principia" census.**—Mr Henry P. Macomber (Curator of the Babson Newton Collection), with the assistance of Mr A. N. L. Munby (Librarian of King's College, Cambridge) and Dr F. E. Brasch (of Stanford University Library), is making a census of the owners of all copies of the 1687 quarto first edition of Newton's *Principia*; and also a census of all copies of the thick largest paper *folio* presentation issue of 1726. (See *Isis* 42, 230-32, 1951).

If you have a copy or copies of either of these, will you kindly assist by sending the following information:

1687 edition:

- (1) Does it have the "apud plures Bibl." imprint, or the "apud Sam. Smith" imprint on the title?
- (2) Has it any bookplates or autographs of former owners, or any other identifying features?
- (3) Are any pages missing?
- (4) How is it bound?

1726 folio issue:

- (1) Is it bound in red or green morocco in the Harleian pattern, with gilt edges?
- (2) Has it any bookplates or autographs of former owners, or any other identifying features?
- (3) What is the exact size of the page in centimeters?
- (4) Does the paper have the crown and fleur-de-lis water-mark?

Thus far, 114 copies of the 1687 edition and 19 copies of the folio 1726 issue have been located. Only 15 copies found with the "Sam. Smith" imprint. Do you know of any private collectors or small libraries owning copies?

Please address:

Mr Henry P. Macomber, Curator  
Babson Institute Library  
Babson Park, 57, Massachusetts, U.S.A.

**Babson Institute of Business Administration (Wellesley, Massachusetts).**—*Science in Industry* is the new course being offered at Babson Institute by Professor **Karl W. Deutsch**, Professor of History, Massachusetts Institute of Technology, and Professor in the Division of General Education at Babson Institute. Its aim is to help students who are entering the business and industrial world to acquire an understanding of the historical development of scientific thought. Through the use of case histories, the future business leaders learn how new discoveries, the development of theories, and the application of new techniques in experimentation may alter the pattern of competition between industries and companies and produce new products and practices. In addition, the students study the contributions of scientific research in industry, and the basic principles of its organization.

**XIth International Congress of Philosophy.**

—The XIth Congress will meet in Brussels 20-26 August 1953. Secretary: Ch. Perelman, 32 rue de la Pêcherie, Uccle-Bruxelles, Belgium.

**International Congress on Medical Librarianship in London in July 1953.**

—Sir Cecil Wakeley, K.B.E., C.B., President of the Royal College of Surgeons of England, has kindly consented to accept the honorary presidency of the Congress. The programme will include formal sessions for reading and discussion of papers, visits to medical libraries and social functions. It is hoped also to have in connection with the Congress an exhibition of medical books and periodicals and library equipment. All those actively engaged or interested in medical librarianship throughout the world are invited to participate. Requests for further information may be addressed in advance to the Honorary Secretary, First International Congress on Medical Librarianship, % The London School of Hygiene and Tropical Medicine, Keppel Street, London W.C.1.

**Academy of the History of Science.**

—Eight corresponding members have been elected in 1951, to wit, **R. Hooykaas** of Amsterdam, **W. H. Schopfer** of Bern, **Henry E. Guerlac** of Ithaca, N. Y., **Jean L. G. Itard** of Paris, **Süssman Muntner** of Jerusalem (Israel), **Erwin H. Ackerknecht** of Madison, Wis., **Otakar Matoušek** of Prague, and **Gino Testi** (who died on 19 June 1951). For more details, see *Archives* (30, 958, 1951).

**Brazil. First Brazilian Congress of the History of Science.**

—The first Brazilian Congress took place from 14 to 21 July 1951, in Rio de Janeiro, under the presidency of Professor Ivolino de Vasconcellos. An account of the proceedings may be read in the *Revista Médica Brasileira* (31, no. 3, p. 179-88, Sept. 1951).

**Tycho Brahe.**

—The Swedish National Committee of Astronomy announces that the ruins of Tycho Brahe's observatory Stjärneborg on Ven have again been excavated and are now protected by a building. A ceremony will be held there on 27 October in memory of Tycho Brahe's death on 24 Oct. 1601. (*The Observatory*, 71, 207, 1951).

**History of science in the Harvard Library.**

—The Farmington Plan was agreed upon by the American Libraries "to make sure that every subject will be adequately covered by a library somewhere in the United States." "At present it covers the publications of only seventeen foreign countries, applies only to new books, and excludes such important types of material as serials, government documents, and

non-trade publications. Essentially, however, the plan's objective is that every subject shall be assigned to a library and that each library, in the subjects assigned to it, shall attempt to collect everything that may reasonably be expected to be of value to a scholar."

An article in the *Harvard Library Bulletin*, by Keyes D. Metcalf and Edwin E. Williams: Acquisition policies of the Harvard Library (vol. 6, 15-26, 1952) describes the 12 subjects assigned to the Harvard Library by the Farmington Plan. It adds a list of 18 subjects which the Harvard Library makes an effort to cover for the purpose of research; no. 17 in that list reads "17. The *history of science* (a responsibility of Widener), mathematics (divided between Widener and a departmental library), astronomy (chiefly at the Observatory), civil, electrical, mechanical, and sanitary engineering (in a departmental library), physics and chemistry (in departmental libraries), geology (divided among several collections), mineralogy (in a special

library), and biological sciences (divided among seven major collections)."

**Doctor degrees in Hungary.**— A law issued by the Presidium in September 1951 forbids the awarding of doctor degrees in Hungary. After having completed their studies, physicians and jurists will be allowed to call themselves "diplomized physicians" or "diplomized jurist," etc. Only men who have rendered great services to the state or nation will receive a doctor's degree *honoris causa* irrespective of their education (*Schweizerische Hochschulzeitung* 24, 277, 1951).

**Pilgrimage by air.**— It is typical of our time that among the Muslim Pilgrims who left Arabia on 12 Dec. 1951, after having accomplished the Pilgrimage, 80,088 travelled on ships and 12,806 by air; to the total of 92,894 should be added those who returned by land, probably a small number. (*Oriente moderno* 32, 42 1952).  
G. S.