Palestine Journal of Mathematics

Vol 13(1)(2024) , 340–357

SOME REFLECTIONS ON DAVID EUGENE SMITH: MATHEMATICAL EDUCATOR, HISTORIAN, COLLECTOR

Peter J. Larcombe and Gurlat Singh

Communicated by Ayman Badawi

MSC 2010 Classifications: Primary 00A09.

Keywords and phrases: D.E. Smith; life, interests and legacy.

Abstract Aspects of the life and legacy of American D.E. Smith are discussed. Literature attests to the high regard in which he was held by those who came into contact with him, and to the mark he made—both in his native country and beyond—as a consummate mathematical educator who began reforms in teaching during the early 1900s and as an avid historian whose monumental collection of artefacts was donated (to Columbia University) to inform students and professionals of the time, and those of future generations, about the heritage of the discipline.

1 Introduction

In a recent essay Larcombe and Wilson [10] presented a personal *envoi* that concluded the 1911 text *The Teaching of Geometry* [22, pp. 331–334] written by American mathematician, educator, and historian of mathematics, David Eugene Smith (b. January 21st, 1860; d. July 29th, 1944). Comprising six passages, it offered beautiful imagery to describe the humanity of scholarly mathematical endeavour and disclose a sense of academic community—both of which remain very much relevant today. Having provided brief biographical details in [10], we concentrate here on selected aspects of his life and his legacy which give the clear impression of a true scholar who prosecuted his responsibilities with great professional conscientiousness and moral diligence. We have drawn on the excellent on-line biographical account [12] for basic details and references to literature on which this article is based, and reiterated (in Section 2.2) parts of the on-line piece by E.F. Donoghue [5]; similar material [16] has also been of use in this regard.

2 Study, Work and Interests

2.1 Study

David E. Smith's early education was a wide one, supported by enthusiastic parents who facilitated his studies. Awarded a Bachelor of Philosophy degree in 1881 from the then relatively new Syracuse University (in his home state of New York), and a Master of Philosophy degree in 1884 (also being admitted to the bar that year, having been encouraged to study law by his father who was a much respected attorney in New York's Cortland County and employed his son as a clerk and notary), a promising career in law was relegated when, that same year, Smith was employed as a replacement teacher at Cortland Normal School where he caught the eye of the principal who then offered a permanent position. Accepting, over the next three years Smith juggled this new role with part time law work for his father and, additionally, continued his studies at Syracuse for a doctorate in the history of fine arts; this was awarded in 1887, whereupon he gave up law work and started to add topics in mathematical history to his regular portfolio of teaching.

2.2 Work and Interests

It was at Cortland that Smith developed a love for instruction in mathematics and the lineage of the subject, setting him on a career path which allowed him to immerse himself in many different strands of the discipline. Further posts at Michigan State Normal School in Ypsilanti (Head of Mathematics, 1891–1898), and Brockport (New York) Normal School (Principal, 1898–1901), preceded Smith's appointment as Professor of Mathematics at the prestigious Teachers College,

Columbia University (in New York City)—then rivalled only by the School of Education at the University of Chicago—where he spent the rest of his working life until retirement in 1926. At Ypsilanti Smith developed the kernel of what would become his robust and imaginative plans for mathematics education. The normal school there, affiliated with Michigan University, had expanded to provide teacher education for all types of public schools—both common (localised community-funded) schools and later secondary schools. Smith, heading the mathematics department, guaranteed the quality of teacher education in the subject by balancing its professional and academic sides. He began to publish, and became known as a mathematics educator—not only nationally, but also internationally—and the subsequent move to a senior administrative position at Brockport permitted him to write and to grow his reputation in this nascent field—one that was forever to change as his ideas gained traction and his body of texts proved to be decisive in shaping mathematics education in the United States. Originally associated somewhat loosely with Columbia University, Teachers College had evolved to be a stand-alone professional school of university rank; students enlisted had to be college graduates or experienced teachers. By 1910, the College had strengthened its status even more, and constituted a graduate college for education within Columbia University. Smith was called to Teachers College in order to raise in particular the mathematics department to this standard, and over the years—due to his good relations with the mathematical community across the country—he was able to serve as an effective officer who linked the demands of mathematicians with needs of professional teacher training as they matured side by side each other.

During the 1890s and early 1900s, as enrolments in American high schools increased, national committees were convened to examine education and tasked to recommend curricular reform. For mathematics, the proposal was to decrease emphasis on rule-based learning and so called 'mental discipline', and move towards a more inductive approach with practical applications that would better equip students for college. To be credible, this would necessitate that teachers be well versed in technical mathematics and knowledgeable in successful classroom delivery strategies. Smith was a leader in developing programmes that combined the study of mathematics and teaching praxes. At Michigan he offered one of the earliest courses in methods for teaching algebra and geometry at secondary level, and from his school experiences he published in 1900 *The Teaching of Elementary Mathematics*—a handbook for teachers that would become a seminal work in the field of mathematics education (*The Teaching of Arithmetic* appeared in 1909). Education as a professional subject was to be found only occasionally in American colleges and universities at the start of the 20th century, though there existed a few courses of collegiate grade on the teaching of various academic subjects which included mathematics, english and history. So far as mathematics was concerned they amounted to little more than reviews of traditional subject matter as taught in the high school, and nothing appeared in discussions which dealt with principles behind selection of apposite subject matter, improved methods of presenting topics, or world literature as connecting with the vitalisation of educational work. In other words, the modern type of teachers' learning schedule in algebra or geometry that was to emerge and become the norm did not then exist save in Smith's classroom at Michigan where he also designed a course with focus on the history of mathematics—unique at the time—that examined how the discipline had developed and been taught in the past. On reflection, Smith introduced mindfulness of ancestral roots and bearing into the syllabus of mathematical education in ways that proponents of 'curriculum decolonisation' call for today, which confirms his forward thinking in academic terms and in a broader societal context; given long held and entrenched viewpoints concerning teaching as the 1900s began, his mission to alter the nation's educational narrative was revolutionary in its own reasoned and conservative ways.

Smith's interest in history continued throughout his career, and he made it a hallmark of his teaching blueprint. At Teachers College he developed graduate courses for secondary and post secondary teachers that included a two-year or three-year sequence of course work in the history of mathematics, and in 1906 two of Smith's students were awarded the first American doctorates in mathematics education. All of his programmes, whether undergraduate or graduate, shared three distinguishing characteristics—they encouraged teachers to (i) take an active role in determining the mathematics curriculum and identifying suitable avenues of pedagogy, (ii) bring into play a historical perspective when instructing, and (iii) consider and, where appropriate, integrate global viewpoints on education into their work. Smith himself took to the international stage, seeking to establish mathematics education as a field worthy of special study that was sep-

arate from mathematics or general education. He conceived of the International Commission on the Teaching of Mathematics (I.C.T.M.)—serving as Vice President (1908–1920) and President (1928–1932)—and was largely responsible for the organisation of an extensive network of international committees that prepared detailed reports on mathematics instruction in their respective countries. Chairing the American commission, and joining the ranks of other internal national bodies concerned with changes and improvements to mathematical education, he oversaw this area gain prominence, visibility and respect, putting education on a new and solid footing to assure a healthy future; this would nurture and bring to fruition the aspirations of students and educators of mathematics, and in turn support and enhance the field, for decades to come.

Smith wrote extensively throughout much of his middle and later life, producing hundreds of pieces of work spread across books, articles, pamphlets, introductions and reviews (as editor/translator he also published texts, articles and committee reports, and worked on encyclopaedia and periodical entries) [7].[1] His prodigious output—addressing a significant range of topics related to matters mathematical at different educational levels—was matched only by his desire to acquire all manner of objects related to the discipline of mathematics. His first trip abroad was taken in the summer of 1879 during his undergraduate studies, beginning his other life as an inveterate traveller all over the world (this covered Europe, the Middle East, Asia, Africa, and South America) where his wealth afforded the luxury of procuring mathematics texts (ancient and modern), first editions, rare original manuscripts (European, Middle Eastern, and Oriental), historical artefacts, and mathematical instruments. His spectacular personal collection was made available to students and staff at Columbia—where he delighted in sharing his broad knowledge and insight with others—and eventually Smith gave the entire collection over to the institution for safekeeping and as a philanthropic act of public service.

> *"Never in our lives has there been such a necessity for defining clearly our purposes in the teaching of mathematics to the various types of individuals, and for considering how these types may successfully be determined."*
>
> D.E. Smith (1933)[2]

3 Aspects of Personal and Work Ethos

An *in memoriam* piece by Lao G. Simons—detailing at length Smith's collecting activities (with some personal information and one or two anecdotal recollections included)—began with the sentiment that with his passing

> "..., the world lost one of the most colorful and influential figures in the fields of the history and teaching of mathematics. It is not possible to choose the one in which Professor Smith accomplished the most or reached the greatest number of individuals." [17, p. 40].

In a wide ranging essay [40] Smith noted the obvious utilitarian aspects of mathematics, but held that its educational value lay equally in training the spirit as well as mind and body. The draw of mathematics was to him, as a member of a select group, something beyond the physical and a call to the soul—precisely as in the case of music, of painting and other fine arts, of science and of letters. Using his beloved geometry as a frame of reference, he contended that mathematics was able to impinge itself upon mankind in different ways, directly promoting things such as a sense of absolute truth, the ability to think logically and argue rigorously, a love of beauty, a curiosity for knowledge and intellectual exploration, and the need for independent thought; we see his leanings towards the holistic advancement of the species through mathematics in a companion article [41] where he opined on symbiotic benefits of mathematics and poetry, each reflected in the other and both ennobling the human condition. Given his natural disposition it is no great surprise, then, that he frequented the company of a like-minded contemporary mathematician

[1] The checklist [7] tabled all of Smith's outputs over the period from 1892 to (May) 1935. Among his efforts—which included works of a more popular appeal—were the meritorious and ground-breaking tomes *History of Mathematics* (Vol. I: *General Survey of the History of Elementary Mathematics* (1923); Vol. II: *Special Topics of Elementary Mathematics* (1925)). Editorships included the *Encyclopaedia of Education* and *Encyclopaedia Britannica*; it was thought that by the mid to late 1920s about 1/3 of all children had been taught using one or more of his texts.

[2] From the 'Address by David Eugene Smith: As Retiring President of the International Commission on the Teaching of Mathematics' (*The Math. Teach.* **26(2)**, 94–97 (1933); see p. 96).

and humanistic educator Cassius J. Keyser (1862–1947) who—along with many others having the fortune to attend dinners and luncheons hosted by Smith at his home in New York City and while abroad at congresses—recalled his beguiling hospitality where a most personable and gracious manner shone, embedded firmly within a cultured conversational style typical of mid-Victorian upper middle social classes and academic circles. It is no co-incidence, surely, that the communion between Smith and Keyser was predicated to a degree by the fact that while competent teachers, neither was a research mathematician but each had an unwavering and deep seated bond with mathematics and its implications for the lives of students and fellow man.

In '*Religio Mathematici*'—a September 1921 Presidential Address before the Mathematical Association of America—Smith gave his time over to a treatment of the relation between mathematics and a religious attitude of mind, specifically posing the following questions: What bond of concord, if any, is there between mathematical knowledge and religious faith? What influence can an exact, abstract, reputedly frigid science (of the time) have upon the religious nature of man? What, in fact, is the soul of mathematics, and to what wavelengths must our own souls be tuned to catch its message? He added qualifying remarks thus:

> "Such, you will say, are the imaginations of a dreamer; not the serious thoughts of a mathematician. So be it. Were it necessary to make the choice, I would rather be a dreamer without mathematics, than a mathematician without dreams or a teacher without imagination. What I wish to show to those who are not of our calling, however, is that there is no other science that leads so directly to a recognition of the reasonableness of a broad religious faith, and none that parallels so completely the broader tenets of the Fathers." [36, p. 340].

This is an enchanting discourse which deals with notions of religion, tangible immortality, our infinitesimal nature, contact with the infinite, human impotence in the face of the eternal, physical permanence, the drama of space, scientific religion, and mathematical and religious duality (parallels and contrasts), striking a balance between a necessarily subjective tone and wider objective observations; it is the work of a deep thinker and authentic scholar revealing the extent and texture of his religious convictions.[3] Let us see part of his concluding section:

> "And what is the conclusion? Does mathematics make a man religious? Does it give him a basis for ethics? Will the individual love his fellow man more certainly because of the square on the hypotenuse?—Such questions are trivial; they are food for the youthful paragrapher. Mathematics makes no such claim. What we may safely assert, however, is this,—that mathematics increases the faith of a man who has faith; that it shows him his finite nature with respect to the Infinite; that it puts him in touch with immortality in the form of mathematical laws that are eternal; and that it shows him the futility of setting up his childish arrogance of disbelief in that which he cannot see." (p. 348).

Clearly, Smith took this topic as seriously as any other on which he wrote. The works [36, 40, 41] were reproduced, revised and abridged, in a book [49], where essays titled 'Thomas Jefferson and Mathematics' and 'Gaspard Monge, Politician' complete a lovely mini collection (which in fact inaugurated *The Scripta Mathematica Library* series of short texts published by Yeshiva College in New York); they display, for all to see, Smith's suite of interests and his talents as an unprejudiced, open and enterprising writer. A perfect example of this is seen in an extension to [41], where in [49] he narrates the story of 'The Seven Lamps of the Capella Pittagora' in which day and night a priest burns seven candles that sit around the chapel chancel in proximity to the tomb of Pythagoras, relating their significance to any wanderer who visits his gothic shrine. Named *lampas utilitatis*, *lampas decoris*, *lampas imaginationis*, *lampas poesis*, *lampas mysterii*, *lampas infinitatis*, and *lampas religionis*, every one of them stands as a judicious metaphor for some fundamental feature of mathematics; here Smith writes in an unconventional way—using fictional prose (as discussed in [10]) to convey his message with purpose and poise in equal

[3]This is something he shared with Keyser, who believed strongly that mathematics had the capacity to bring humans gently towards contextual ideas of invariance and eternality/infinity in ways meaningful to spiritual health (it offers these aside, he claimed, from other domains—namely, theology, natural science, philosophy, art and religion—to which man often appeals in the quest for constancy in a tumultuous world and refuge from its temporalities; see the 1911 essay 'The Spiritual Significance of Mathematics', *Relig. Edu.* **6(5)**, 384–390). Keyser worked at Columbia University himself, chairing the Department of Mathematics (1910–1916) during his tenure as the Adrain Professor of Mathematics (1904–1927).

measure—reminding us that while the tale is mythical the seven lamps signify realities to all who delight in the subject and who care to muse upon its beauty and possibilities.

In charge of mathematics education at Columbia University, David Eugene Smith brought circumspect impetus and innovation to move forward the cause—initiating and leading temperate teaching reforms attuned to the Progressive Education Movement (this surfaced in the 1880s, and continued well into the 20th century at which point it embraced democratic concepts such as the participation and engagement of citizens in ways designed to produce social, economic and political benefits for all). His drive to manifest an ideal—wrestling it away from an amorphous concept and wrapping some structure around it—was relentless, and by way of example we mention a few pieces of exposition that evidence his attitudes and concerns of the day. In a short document that ponders the human needs within mathematical education (it is a synopsis of an address to the New York Section of the Association of Teachers of Mathematics in the Middle States and Maryland on December 2nd, 1921), Smith noted what relatively little headway had been made at Junior High School level and briefly set down his future hopes accordingly. Aware of the psychology of the typical learning arc—and cognisant, too, of the pace of change both in the education sector and society's mathematical exigencies—the balance between instilling core knowledge with sufficient breadth and suitability for higher study, while keeping students interested in the subject, is evident. The 'humanisation' aspect of mathematics was imperative to the likes of Smith, though he remarked on "..., the danger of so humanizing our mathematics as to leave in the pupil's mind a rather large amount of humanity, but no mathematics at all. ..." [37, p. 27]. This, however, did not detract from his opinion that

> "..., patent to every successful teacher, ... one of our greatest purposes is to reveal to the student something of the soul of our science. It is only with this purpose in mind that we shall succeed in our teaching of what an ancient and worthy Oriental writer called "the science venerable"—a phrase which, etymologically as well as actually, means "the knowledge lovable." "[4]

This is an echo of previous words within a more substantial discussion paper by him on secondary level mathematics—a penetrating and astute piece, it finished with the following judgement:

> "... above all, it seems to me to be our duty to stand for the interest of mathematics for its own sake, for setting forth its beauty of symmetry, for voicing its poetry, for living its religion, and for exalting it for the truth that i[t] sets forth so clearly and for the invariant properties that characterize it in every branch. It is only by being imbued with such feelings and ambitions that we can bring our pupils to love the subject and to feel the great mental uplift that comes from its study. ..." [24, p. 179];

another work which positions sympathetically the technicalities of mathematics instruction across the timeline of the young mind is [31] (also [46]), while in [35] he is more contemplative again and ends with a rallying tone as he suggests an attack on educational barriers be made

> "... with the determination to base our offering upon the teachings of psychology and world experience, with the idea of making our work interesting to the pupil because of its honest applications and its recreational features, and with the knowledge that the rest of the world has made this work a success and that we can do the same. If we do so, there is no reason why, in the course of a few years, we should not have elective courses in the Senior High School that are far ahead of anything that we have at present and of anything that most of us now believe to be possible." (p. 127).

A single page 1916 report of another New York meeting (no precise date given) tells us that Smith spoke of the difference between college preparatory schools and commercial/technical high schools in their treatment of arithmetic, and felt that the overriding justification for its introduction into any type of school should be "... for the purpose of improving the student's power in pure calculation. ..." [26]. Calling attention to arithmetic courses in Sweden, Switzerland,

[4] In front of a 1917 sitting of a similar Association of Teachers audience in New York on October 26th, he had mused over vocational secondary level courses that might benefit from a more industrialised training—the likes of which had already existed in some European countries and was now needed by others as they rebuilt economies after the tolls taken by World War I; his speech was summarised as the short summary report [30].

Germany and elsewhere which had been studied, he suggested that arithmetic might naturally sit alongside other subjects in his home country high schools (see, too, the discussion [39]).

It is perhaps useful to remind the reader that the organisation of education throughout America was not aligned with counterpart European countries as the 20th century began, partly because it had been devolved to state directorates acting autonomously—with no overarching national body holding responsibility to ensure consistency of standards and curricula. This meant that affairs were conducted, and decisions settled upon relatively loosely, in disjointed fashion and with less useful documentation produced for wider consultation than was ordinarily the case abroad (where governments exerted greater global control, and the educational map was more uniform). Additionally, America suffered from lower numbers of university trained men and women able to teach and to take part in exhaustive discussions in and around the teaching missions that lay before all—from the kindergarden through to the university. As it stood in the early 1900s, the American plan was to persist with educational appraisal and evaluation by means of committees and subdivisions thereof, with five central topics designated as points of reference [19, p. 57]: (a) the organisation of schools and the general relation of each kind of school to the others; (b) the mathematical curriculum in each type of school; (c) the question of examinations (from the point of view of the school); (d) the methods employed in teaching mathematics; and (e) the preparation of teachers of mathematics. The greater portion of the article [19] listed the various groups looking after matters as the American arm of the I.C.T.M, while in [21] Smith—in his capacity as President of the American Commission—discussed in some detail the issues faced in America and the work that needed to be done, *con amore*, and shared with colleagues across the Atlantic Ocean (the paper was delivered before Section A of the American Association for the Advancement of Science, in joint session with The American Mathematical Society, at Boston on December 29th, 1909). A recurring theme throughout much of Smith's discourse was a pressing urgency to begin to remove obsolete constituent topics from syllabuses and in their place put modernised versions of algebra, geometry and trigonometry, as well as eliminating overdrill in arithmetic.

On matters of mathematical history we find him writing at length and with huge diversity, able to bring to life the biographies of people in connection with places, cultures and events, adding to existing knowledge, announcing new information, offering opinion, clarifying facts, and so on (see, for instance, [18], [20], [23], [27], [28], [32], [33], [38], [45], [47], [48], [51], [52], [53] as a small representative sample that give a flavour of Smith's expansive and powerful mindset (this is but a fraction of what might have been referenced here, but the titles make the point)—that said, guaranteed access to publishing outlets, coupled with invited lectures and senior committee positions held, regularly gave him free platforms in print); some of his works are littered with footnotes which add real scholarly weight to animated and entertaining narrative. At other times we find him making an entreaty [25] to support a recently established journal whose publication had been interrupted in occupied Belgium (and declaring support by personal subscription; one function of the History of Science Society, founded by Smith and George A.L. Sarton (1884–1956) was to support Sarton's journal *Isis*), or else questioning the accepted reputational status of someone (*e.g.*, [34],[42]); he also got involved in recreational mathematics, posing the odd technical problem (*e.g.*, Problem No. 28 (**2(3)**, 87) and Problem No. 57 (**2(11)**, 318) in two 1895 issues of *The American Mathematical Monthly*), and offering comments/notes (*ibid.*: **1(3)**, 74–75 (1894) and **5(2)**, 58 (1898)).

Although a man of action, Smith often fixed his gaze upwards to loftier planes as men of his ilk and era were wont to do. He mused, for instance, on the close ties between mathematics and aesthetic phenomena known to garner popular appreciation; others had done so before him, and at the start of an interesting 1927 essay he sets the scene for a monologue with words of elegance and flair:

> "In considering mathematics in relation to the beautiful, the range of possibility is so vast that a brief article like this can hardly be expected even to list the salient points of contact. The field might properly include all that we designate as the fine arts or, to use the more expressive phrase of the French, the beaux arts. Painting, for example, might be considered with reference to the works of that great genius in science, in mathematics, and in art—Leonardo da Vinci. Sculpture might equally well be included because of the mathematical principles employed by that majestic user of ponderous masses, Michelangelo. Architecture might have place with reference to the works of

> that Oxford professor of mathematics, Sir Christopher Wren, who rebuilt ecclesiastical London; engraving, with reference to that gifted artist of Nürnberg, Albrecht Dürer, who published the first modern work on curves; music, with reference to the fact that it always ranked as a branch of mathematics until the sixteenth century; decoration, with reference to the geometric designs found in all ages and reaching their highest degree of perfection in the works of the Moslems; and literature, with reference to the mathematics of poetry, and the poetry of mathematics. Indeed, we might properly include the beauties of nature, where mathematics plays a part of which we are usually quite unconscious." [43, p. 419].

Towards the end he quotes Roman statesman, lawyer, scholar, philosopher, writer and orator Marcus Tullius Cicero ("*Omnes artes quae ad humanitatem pertinent habent quoddam commune uinculum*" ["All the arts that belong to humanity have some common bond"]), and then includes a few lines taken from Lord Balfour (Arthur James Balfour (1848–1930), British Conservative politician and Prime Minister from 1902 to 1905), in a flourishing finish, on

> ". . . the two great divisions of human emotions:
>
> "Of highest value in the contemplative division is the feeling of beauty; of highest value in the active division is the feeling of love. . . . Love is governed by no abstract principles; it obeys no universal rules. It knows no objective standard. It is obstinately recalcitrant to logic. Why should we be impatient because we can give no account of the characteristics common to all that is beautiful, when we can give no account of the characteristics common to all that is lovable?"
>
> And why should we who dwell in the domain in which Pythagoras ruled, and in which Archimedes held sway in later times—and Descartes, and Fermat, and Leibniz, and Newton—why should we be impatient because we can only feel the bonds that unite mathematics and esthetics, although we are without power to express the law of union?" (p. 428).

When pondering how to treat the concept of the infinite in teaching he writes of a systemic problem that it is defined without meaning to those who hear of it, and defined symbolically without meaning to those who see it, instead insisting that "Our duty should be something far different. Just so far as we can adapt our work to the minds of our pupils we should make the effort to get much nearer the soul of mathematics than is the case in most of our classes under present conditions." [44, p. 1]; after spending time taking the reader through illustrations of 'large numbers', Smith moves on to tackle the essentials of what we term 'infinity' with clarity and care. The essay ends with general questions for all who hold a vested interest in mathematical instruction:

> "What is the significance of all this? How does it concern our inner natures? Is it merely a phase of cold mathematics that we shall present in a perfunctory fashion and then assign "the next ten problems for tomorrow"? That depends largely upon ourselves, upon our vision, upon our imagination, upon our conception of the mission of the teacher, and upon our recognition of our opportunities. We may well leave the questions unanswered, for no answer is general; each must answer them for himself. Shall we live our lives to prepare our pupils for examinations upon the square roots of decimals and upon dividing by a polynomial, or shall we open up a vision of some of the things worth while? No one can answer that question for all; but all can answer it for one,—each for himself." (p. 9).

A 1976 Ph.D. thesis by Joe Tom Rodgers ('The Philosophy of Mathematics Education Reflected in the Life and Works of David Eugene Smith', submitted at the George Peabody College for Teachers in Nashville, Tennessee) exposed three currents of thought running through Smith's writing: the nature and value of history; eclecticism and the avoidance of extremes (it was said that he was not prepared to countenance any doctrine wholeheartedly until it had proven its worth in practical experience[5]); the aesthetics and invariance of mathematics. We pick off some of Rodgers' findings:

[5]His textbooks exhibited, by *consensus omnium*, a 'middle of the road' approach to professional life, aiding their approbation and sales.

> "Smith believed the history of mathematics had a significant role to play in the mathematics classroom. His intimate knowledge of history made him cognizant of the rhythmic nature of history—especially in matters ped[a]gogical. . . .
>
> Smith also valued the history of mathematics because he felt it accurately portrayed mathematics as a constantly changing subject. Teaching would be improved if teachers were familiar with the success and failure of curriculums and teaching methods of the past. . . .
>
> Smith felt the history of mathematics should play a role not only in the classrooms of practicing teachers but also in the preparation of prospective teachers. . . ." (pp. 120–121),

and later,

> "Smith consistently advised avoidance of extremes in education—particularly in regard to teaching methods. He felt most efforts to reform the mathematics curriculum were ill-considered and subject to abuse. In effect he endorsed a "common sense" approach to all matters with great heed paid to lessons learned from past efforts. The valuable features of past plans would be retained but without the extremes Smith associated with most teaching methods. . . ." (p. 122).

The dissertation sticks to its remit as a convincing and well researched commentary on Smith's educational tenets and propensities, to which this essay hopefully adds.

4 The Smith Collection

Smith firmly believed that the teaching of mathematics should be closely associated with its genealogy and evolution. As a historian of mathematics he wrote and lectured widely on this, and also amassed mathematical materials from past periods: texts, documents and artefacts. When Smith began donating his collection to the Columbia University Libraries in 1931, included were 12,000 printed books on the history of mathematics ranging from the 15th to the 20th century—it also comprised 35 boxes of mathematically related historical documents, 140 boxes of his own professional papers, 350 volumes of western European manuscripts covering the same period, 670 volumes of Oriental (mainly Arabic and Persian) 8th to early 20th century manuscripts, 88 volumes of Chinese manuscripts, 363 volumes of Japanese manuscripts, 3,000 prints and portraits of mathematicians, and some 300 mathematical instruments and related objects (these figures have been taken from a short piece written by Frank J. Swetz and Victor J. Katz [54] that appears in the on-line journal *Convergence* (published under the auspices of the Mathematical Association of America)). Smith was a man with an eye for beautiful art (aesthetics having formed part of his doctoral studies), and three months after his passing an editorial by William D. Reeve (with whom Smith collaborated in a series of mathematics textbooks for use in elementary and secondary schools) quoted him as saying

> "I love to sit here and let my eyes wander. Wherever they fall I love again my experience in finding that particular treasure—on a trip down a river infested by crocodiles; sitting cross-legged in the mud with a native chief; wandering among the ruins of an ancient Buddhist monastery, ghostly in the moonlight." [13, p. 279].

Upon joining Columbia in 1901, he granted undergraduate student access to his personal library which was already taking shape as a holding of undisputed historical significance. Such was the gesture and its worth, one of his pupils (Sophia R. Refior, a former Ohio state school student) was moved to write the following:

> "The students in the seminary in the History of Mathematics under Dr. David Eugene Smith have been privileged at various times to visit the unique private library of their instructor and to use such manuscripts as were necessary in their field of research. The inspiration derived from examining these priceless objects has stimulated one of the pupils to write the following account. . . .
>
> . . .

> Dr. Smith has personally collected these rarities during his numerous travels in Europe, Asia, Africa and South America and has spent much time and money as well as care in selecting them. He has received them from friends or bought them in bookshops, but more often he has ingeniously gathered them from remote and obscure places, with the view in mind of preserving them for his students. The collection is more than a collection,—it is an expression of the interest and personality of Dr. David Eugene Smith.
>
> This Library offers original source material on various subjects that cannot be found elsewhere. Hence, it vitalizes the history of mathematics for all students, but it is of priceless value to research workers." [15, p. 269].

Today, the combined lifetime accruals of Smith and his friend George Arthur Plimpton[6]—the American publisher and philanthropist (1855–1936)—exist as bountiful resources for understanding the development of mathematics and the lives and work of some of the people and cultures responsible for its advances; these archives are available to researchers through the Rare Book and Manuscript Collection at Columbia University (shortly before his death in 1936, Plimpton—who had given Smith license to buy any manuscript of interest—donated numerous items to Columbia's Butler Library, indeed following Plimpton's remarriage (in 1917) the Plimptons and the Smiths were to travel together on visits to libraries and bookshops throughout the world). Further details on Smith's bequeathment can be found in a piece by Bertha M. Frick (career librarian, and one time incumbent as curator of the David Eugene Smith Library) in the first (January 1936) volume of the journal *Osiris*, with sections given over to Printed Books and Pamphlets, Manuscript Material, Portraits, Numismatics, and Instruments, together with a short list of articles by Smith which describe many of them [8]. This special Volume of Studies on the History of Mathematics and the History of Science was presented to him by the editor, on behalf of associate editors and thirty six contributors, to mark his 76th birthday and to register gratitude for the agency he had brought to this field[7] (the dedicating words themselves are reproduced, in full, in the Appendix, for the pleasure of the interested reader). In 2013 Diane R. Murray published her Ph.D. thesis analysing surviving documents, images, objects, college announcements and catalogues, and secondary sources related to Smith's legacy [11].

Drawing directly on his hoard, Smith was happy to serve up some unusual and appetising nuggets for consumption in print. A qualifying Editor's Note in *The American Mathematical Monthly* of February 1921 (**28(2)**), at the outset of Smith's 'Among My Autographs' section, reads

> "The large collection of autograph letters of famous mathematicians, now in the library of Professor Smith, includes many hundred valuable documents, most of them unpublished, and many of them either containing valuable historical information or giving such an intimate view of their writers as to be interesting to all who care for the mathematical sciences. On this account the editors have asked Professor Smith to prepare for the MONTHLY a series of brief articles under the above title, giving to its readers the opportunity of knowing something of the interesting letters in his collection." (p. 64);

Smith obliged handsomely. His first one, accompanying this request, was titled 'Delambre and the Founder of the Smithsonian Institution', while his second and third appeared in the next issue

[6] Smith met Plimpton—in charge of the New York office of the publishing house Ginn and Company—whilst working at Brockport, and subsequently was asked to advise him on acquisitions for his mathematical textbook collection; by 1908, Plimpton had assembled the most complete library of arithmetics printed before 1601. Since he generously permitted Smith's graduate students at Columbia access to his archive, they had the rare opportunity to study valuable primary sources—accordingly, to make the Plimpton Collection more widely known, Smith prepared an illustrated two-volume catalogue, *Rara Arithmetica* (1908). An account of their co-operative acquisition of artefacts is told in a 1998 essay by Donoghue [4].

[7] A write up of the event acknowledged the contribution made by Smith to the humanistic and cultural movement of the sciences in bringing together scientists, historians and philosophers—under the banner of the History of Science Society which he co-founded in 1924 (becoming President in 1927)—and concluded with some warm remarks:

> "It is very evident . . . that the history of science movement, together with the present influence and progress of this society, have combined to build for Dr. Smith a monument which his fondest hopes did not envision. The intellectual world owes him a great debt, and the officers of this society take this opportunity to acknowledge that indebtedness and to offer him their congratulations." [3, p. 426];

the authors, writing from the Library of Congress, observed that the assembly—termed a *Festschrift*—was ". . . indeed an excellent expression of appreciation and method of honoring those to whom honor is due." (p. 424).

('Dupin as Secretary of the Ionian Academy', and 'Picard and Cassini'). The April issue saw 'Monge and the American Colonies' and 'Descartes's Appreciation of Huygens the Elder', with many more to come (the first seventeen of them filled Vol. 28 from the February issue onwards, while the following year's Vol. 29 accommodated a further twelve of these literary miniatures). Frick wrote, of the physical matter on which they were based,

> "The library's collection of autograph letters has more than four thousand items. These contain source material not only for biographic information but many of them also contain material showing the development of certain mathematical formulas and theories. In some instances practically all the existing correspondence of an individual is to be found in this library. Such characters as ARAGO, DELAMBRE and FRANCŒUR are each represented by some seventy-five manuscripts. Outstanding scientists, such as D'ALEMBERT, DESCARTES, GALILEO, NEWTON and WALLIS, are all represented . . ." [8, p. 82];

these types of short feature were packed with facts, providing readily digestible and learned (and sometimes never before seen) snapshots into the lives and work of their subjects—welcome, creative and enriching supplements to historical literature from a master of his craft. Another example of expressiveness from his fertile mind is seen in a paper which begins

> "One thing which impresses the student of mathematical problems is that several which he would naturally classify as purely fictitious and of the nature of pleasing puzzles apparently had their origin in genuine applications of mathematics to questions of real life. . . ." [29, p. 64];

the scale of detail present here is imperial, and designed to stand the test of time. In a similar vein Smith, over the second half of 1925, left us a triplet of articles in *The American Mathematical Monthly* under the broad running title 'In the Surnamed Chosen Chest', "selected . . . merely for the purpose of arousing at least a slight degree of curiosity, of securing the attention of those who love old books, and of tempting some friend, or friends, to taste the pleasures of knowing of other chosen chests than those which he, or they, may guard with jealous care." (**32(6)**, 287).

5 Plaudits and Praise

David Smith was a man who gave his time willingly and amiably to many causes and matters mathematical, while procuring thousands of related antiquities for posterity; as an irresistible moving force in mathematical education and the history of mathematics, the esteem accorded to him was high indeed. He had an enormous impact on American education through his participation in most of the well known national organisations where he could steer policies and invoke change—through his skills in collecting commodities to support teaching and to elevate the notion of historical heritage, through his numerous publications and their eclectic content (he also founded in 1932, with Jekuthiel Ginsburg, the journal *Scripta Mathematica* which ran for over four decades[8]), and by his personable and outgoing demeanour that opened many private and professional doors. This puts him inside a group of elite men and women whose contributions to society have not diminished with the passing of time.

Noting Smith's abundance of knowledge gleaned from many countries and languages, Reeve's tribute [13] finished with these words:

> "A scholar and a great teacher, he was loved and revered by all who had the good fortune to know him. We shall not see his like soon." (p. 279).

He produced another eulogy the following year, writing

> "We honor Professor Smith not so much because of what he did, but because of what he was. The most important thing his students ever obtained from his courses were "caught not taught." There is something remarkable about the enthusiasm and devotion of students who have had the good fortune to know him as teacher and friend.

[8]Ginsburg was Professor of Mathematics at New York's Yeshiva University. C.J. Keyser was a member of the strong editorial board, the journal's theme being the philosophy, history, and expository treatment of mathematics; this new venture arose after a lack of support to resurrect or replace *Bibliotheca Mathematica*, the publication of which had ceased in 1915.

> It was my privilege to know Professor Smith in an intimate way since 1923. As a "wielder of the blue pencil" [to edit, especially to censor, written documents] he had no equal. As counselor in time of uncertainty and adversity he was always most sympathetic and helpful. As a friend he was most unusually devoted." [14, p. 212],

and continuing "We know that he did many things of real worth that we cannot yet appreciate. Perhaps he himself did not realize what he had actually accomplished. . . ." W. Benjamin Fite's brief and routine obituary gave, by his own admission, ". . . only a faint and inadequate picture of David Eugene Smith the man." [6, p. 238]—wherein he was described as a humanist in the finest sense of the word—but Fite did wish to add the following:

> " "Not on the vulgar mass
> Called 'work' must sentence pass."
>
> He was not merely an active worker in more or less narrow fields of scholarship. He was learned in a broad field and his learning was tempered by a delightful sense of humor and a mellow and charming personality."

Frederick E. Brasch, in his panegyric, observed that while Smith may not have been famous as a research level mathematician, ". . . to the world of scholarship he will ever be known as the "Great Humanist in Mathematics." " [2, p. 257], commenting on the keen analytical mind of Smith and the 'synthetical' methods he used to achieve his desired goals. Quoting Smith's own words about Isaac Newton's acute intellect and engagement in a plethora of mathematical activities, Brasch wrote

> ". . . Dr Smith too had genius in a degree, though of another kind.
>
> (a) He had capacity for friendship and hospitality.
> (b) He had capacity to inspire and aid scholars.
> (c) He had appreciation of the works of others.
> (d) He had capacity for recognizing beauty in mathematical prints and instruments and in Oriental art books.
> (e) He had capacity for organization and administration.
>
> Dr. Smith was not a Newton scholar in the technical aspect, but a Newton in the discovery of the humanistic and in the interpretation of the very abstract thoughts of mathematics."

According to Brasch, Smith's enthusiasm for the history of mathematics arose from the fact that to him it revealed what is most precious and most significant in our civilization—he also believed the attainments and triumphs of past generations should be built upon and made the means of realising still greater things. Said to be almost obsessed with the search for truth and beauty in the field of mathematics, its history and its teaching, to these ends he set neither limit nor expense to obtain material objects that would help; in this regard, while his financial affluence (augmented by a steady income from his many textbooks) placed him in ideal positions to make purchases, his commitment and ambition were immense. Brasch also reported briefly on the conferment of the Gold Star of the Order of Elim upon Smith by the Persian government ". . . in recognition of his interest in the mathematical achievements of the country, . . ." [1] (Smith had travelled for four months from the winter of 1932, visiting chiefly Persia, Iraq and Syria to meet notables and augment his collection) and for his enthusiasm towards poetic works of the lionised 'Astronomer-Poet of Persia' Omar Khayyám (1048–1131).[9]

Issue No. 5 in Volume 19 (May 1926) of the journal *The Mathematics Teacher* marked the retirement of Smith from active service at Teachers College, whereupon his students and colleagues arranged for the presentation to the College of a portrait of him and, at a dinner in his

[9] Fite wrote [6, p. 238] "His love of art which showed itself in his undergraduate days remained with him to the end and prompted him to make a metrical version of the *Rubáiyát of Omar Khayyám* based on a verbatim translation of Haslinn Hussein." (the book was given the title in 1859 by its first interpreter and translator, the English poet and writer Edward FitzGerald). It was for this work (in 289 quatrains) that Smith received in 1933 a decoration from the Shah of Iran, Rega Khan Pahleri, the original edition—being the first text to be illustrated by a Persian artist of standing—reproduced and reinterpreted in different forms over time to become a phenomenon of cultural veneration (in the English-speaking world it was popularised, clubs of appreciation formed, and a '*fin de siècle* cult of the Rubáiyát' had emerged).

honour, they expressed to him their appreciation of the uniqueness of his work and their regard for him as a friend and teacher. A transcript of the award proceedings are to be found over pp. 297–305 in the issue (it contained two back-to-back (and hitherto unseen) articles by Smith [40, 41]) which recorded compliments and personal anecdotes that—together with others elsewhere—bore witness to his benevolence, generosity, cordiality, goodwill, charitableness, humility, fellowship, work ethic, sagacity, intuition, providence, fierce acuity, competence, prescience, authority, zeal and dynamic character. Perhaps the most enjoyable passage to look back on from the evening is one spoken by the Toastmaster, Clifford B. Upton (a colleague on the staff at Teachers College), to begin his introductory remarks:

> "Friends, we have come here tonight to show the love of the pupil for his master and to voice our appreciation of the work of a great teacher and a noted scholar. But as we start to measure our appreciation we encounter many obstacles. In the first place, it is hard to find an adequate unit of measure; in the second place, it is difficult to fix the boundaries of the subject we are measuring. We start to measure David Eugene Smith, the teacher, but before we finish we are measuring Dr. Smith, the scholar, and suddenly he merges into Smith, the historian—and then he becomes mathematician, and then in turn author, critic, traveller, diplomat, and finally, distinguished representative of American education in some notable International Congress in Europe. Depending upon our point of view his genius changes like the colors of a chameleon. We soon realize that Dr. Smith isn't just one David Eugene Smith, but a dozen of them—he's a superman, or better, a multi-man." [55, p. 259].

Of the many laudations recorded, one in particular stands out for its personal geniality. A former mathematics teacher and ex student of Teachers College, Mrs Mary Alice Pilliod, spoke of the calm and serenity of Smith's office (Room 212), recounting—as fledgling teachers under the wing of Smith, aware of resistance to modernising ideas in the field, and troubled by the febrile environment that turbulence and disruption of the old ways brings—those many times in moments of strife and doubt when

> "... we have been reassured that progress does not mean complete denial of the past, but rather the constructive use of it, and that love of mathematics does not imply retrogression but rather progression, and we have gone back to our various classrooms refreshed and inspired to new efforts." (p. 271).

Trainees were being inducted into the philosophy of Smith which held that mathematics should be humanised to meet fully the needs of the child—grounded in initial practical problems of interest and suitability, but later tailored to maintain civilisation through its social significance in a pupil's cultural background and welfare. Later, she said

> "Nowhere except in that quiet room could we have had our eyes opened to the close union between mathematics and music, mathematics and architecture, mathematics and poetry, mathematics and religion. Nowhere could we have so regained our faith in our subject, not only in its practical aspect, but in its cultural importance. A subtle but profound influence toward a respect for scholarship made us feel that, for the future of education and hence of the race, delight in pure reason (the "magic of the mind") should not be entirely neglected for the merely practical. ..." (p. 272).

The penultimate speaker of the evening was C.J. Keyser himself, the last to approve deeply, and with sincerity, of Smith, his life, and his work—in other words, his *raison d'être*:

> "... Not all of us have had the pleasure of being pupils of Professor Smith, but all of us have had lessons from him. His presence has been a living lesson to us in gentleness and in kindness. His presence has been a living lesson in the elevation of spirit above the sordid things of the world. It has been a living lesson of catholicity of appreciation. It has been a living lesson in magnanimity of spirit. It has been a living lesson in that quality of judgment in art which critics call good taste. It has been a living lesson in loyalty—loyalty to pupils, loyalty to colleagues, loyalty to his great subject." (p. 275).

The commendations in the room were varied, but all were wholesome and sincere; Smith's response at the close, in thanking all, was typically eloquent and evocative:

> "... I cannot imagine the man of whom you are speaking. For myself I might say a few words, but not for the man who has been described in such glowing terms." (p. 276).

Simons ended her own encomium with these words [17, p. 49], which are quite fitting:

> "Apart from being an international educational leader, Professor Smith was a great teacher. On the occasion of his seventy-fifth birthday, he was presented with a large collection of letters from former students. Among these was one from Miss Muriel Bowden which expressed fully their attitude toward him, ...
>
> *Dedication*
>
> TO DAVID EUGENE SMITH
>
> Who by his great scholarship has given to all his students a love of sound learning;
> Who by his glowing wisdom ever transformed the dead letter into the living spirit;
> Who by his sincerity and fortitude has inspired and encouraged all those who have known him in the quest for truth:
>
> MASTER AND FRIEND."

A review of the 76th birthday presentation volume of *Osiris*, by A.J. Kempner, spoke of Smith and people like him ('*Osiris*. Studies on the History and Philosophy of Science and on the History of Learning and Culture', *The Amer. Math. Monthly* **43(9)**, 564–570 (1936)), offering a motto by Goethe[10] that "... might well be used ... both for the volume of Osiris, ..., and for the life work of the jubilar." (*"Wer vieles bringt, wird jedem etwas bringen"* ["Whoever brings much will bring something to everyone"]) (p. 564). Kempner wrote

> "Talents of their kind are far more rare than ability to do the ordinary run of research, since a greater breadth of vision and broader interests are involved. It is becoming increasingly clear that we need a stronger leavening by men and women who have clear ideas concerning the future development of mathematical pedagogy, together with ability to appreciate the trends of mathematical research and to acquire more than a bird's eye view of mathematics as a whole. It must be possible to open for such rare specimens rich and valuable careers within the fold of mathematics, instead of forcing them into the field of professional "education." " (p. 565);

this is an early glimpse into the separation of mathematical educators and researchers which, well over eight decades later, still causes difficulties within the mathematical community in terms of the ways members of one camp are viewed and (dis)respected by the other (in reality, tensions between them have increased in most countries, something of which Smith would have disapproved as he found value in both kinds of practitioner and worked to generate a symbiosis between them even as mathematical education, as a discipline, was finding its feet).

In 1936, Smith published a piece on British civil servant, mathematician, classical scholar, historian of ancient Greek mathematics, translator, and mountaineer, Sir Thomas Little Heath (1861–1940), saluting his life and works as a man who had the power of literary expression, "... blending in one the mathematics, the philosophy, and the poetry of Ancient Greece." [50, p. xxiii]. He began with the following:

> "One who would aspire to marked success in any branch of the history of mathematics must be possessed of certain abilities rarely combined in a single individual. He must know much more of mathematics than what he proposes to include in his study—the offshoots from these branches and their relation to the science as it has developed since the period of their inception. He must possess a working knowledge of the classical and the principal modern languages, the former for his source material and the latter for the interpretation of this material by later writers. He must be able to express himself with precision and with a degree of elegance that will command the respect

[10] Johann Wolfgang von Goethe (1749–1832), the German poet, playwright, novelist, scientist, statesman, theatre director, and critic.

> and the attention of those who will probably read his works. He must be erudite but not bookish, philosophic but not pedantic, profound but not dull.
>
> With all these requisites Sir THOMAS LITTLE HEATH was early endowed, and richly so. . . .” (p. v);

as one or two individuals have, we can only speculate as to whether or not, at the time of writing, Smith was aware that the attributes he listed applied most assuredly to himself. In broad outlook, a British counterpart of Smith was the mathematician and logician Augustus de Morgan (1806–1871) who was a steadfast populariser of mathematics—very much interested in mathematical education, he felt strongly that those who undertake instruction in mathematics should be familiar with its development (as others did with a similar predilection); another prolific writer, he also cultivated throughout his life an early passion for collecting rare and ancient books. It is, however, no exaggeration to state that Smith was unique and stands alone—his incomparability is such that there was no-one like him during his lifetime, nor has anyone since come close to replicating the path he took and the imprint he left on different tiers of the education sector. He was a man of his time, who should not be forgotten—one of a rare breed whose destiny, once set in motion, was fulfilled in both word and deed with a seemingly inexorable inevitability.

The 19th century was one of the most exciting periods in the history of mathematics. New branches of the subject were created, older ones underwent extraordinary development, and the foundations of various sub-divisions were re-examined, deepened, and systematised. It was an era that witnessed the construction of non-Euclidean geometries, set theory, non-commutative algebras, and mathematical logic, seeing a tremendous expansion of projective geometry, function theory, topology, differential geometry, group theory and abstract algebra, along with the introduction of unprecedented standards in logical rigour coupled with a precise axiomatisation of mathematical calculus.[11] Into this fertile and fluid period of mathematical overhaul Smith was born. Not to be counted among the small company of cutting-edge trailblazers who drove forward mathematics with their seminal technical work (such as Gauss, Galois, Riemann, Cayley and Lie), he nevertheless absorbed what we in hindsight are able to affirm was a far reaching prioritisation in the discipline to seal his own locus within it as a new century dawned and subsequently gained momentum—imposing himself and his own brand of leadership and foresight on the field of education.

Given all of this, we must confess to a mix of confusion and curiosity regarding what seems to be an anomaly in the form of a text, *Every Man a Millionaire: A Balloon Trip in the Mathematical Stratosphere of Social Relations* (Scripta Mathematica, New York (1937)), authored by Smith. It contains 37 animated, entertaining and at times borderline madcap (fictitious) proposals for, and reports of, a better and more equitable society—effected by design, invention, scheme, and sheer force of personality—and is layered with charitable financial altruism

[11] On the other side of dividing waters, winds of educational recast and redesign were blowing in a different direction with ramifications for mathematics. From the end of the financially debilitating Napoleonic Wars through to the triumphant showcasing Great Exhibition of 1851 and beyond, technological achievements in steam power and other innovations transformed Britain’s manufacturing base as political stability encouraged investment in its railway, shipping and factory industries. This fostered the exploitation of its resources, and led to unprecedented economic growth in tandem with new undertakings in education. During the 19th century philanthropic ventures such as free schools emerged and ‘practical’ mathematics (nominally arithmetic and geometry) served things such as accounting, navigation and surveying, while in universities (and military academies) geometry and calculus were taught to a higher level—each in time updated to accommodate greater levels of rigour imported from France and Germany.

Whereas their previous learning had almost exclusively been self directed (supported by private tutors together with informal access to libraries and scientific meetings where possible), by mid century opportunities for women to study at colleges had also opened—confirmation of a growing social awakening that was wedded in part to shifting attitudes towards mathematical teaching and wider value systems moving through education; names such as de Morgan and Charles Babbage (1791–1871; mathematician, philosopher, inventor, mechanical engineer, and conceptual originator of the eventual digital programmable computer) were at the early vanguard of ideas and thinking that would result in syllabus modernisation in mathematics as part of a wider effort to make education more inclusive and less a preserve of the rich and the entitled. As the 20th century began Britain, however, lacked the kind of enigmatic counterpart to Smith—one with international presence, and able to act as an axis for change with vigour and verve—-in its desire to drive the system of mathematical education forward at tertiary level in a structured way and supported by precursory teaching at lower grades. The influence of several reform movements in mathematical education slowly became manifest, from the late 1800s onwards, through names such as John Perry (1850–1920) in England (the so called Perry Movement did foreshadow, by a quarter of a century or so, some of the significant features of general mathematics of the American junior high school) and Christian Felix Klein (1849–1925) in Germany (Eliakim Hastings Moore (1862–1932) also contributed to fresh educational strategies in America at secondary school and higher level), but it is not unreasonable to state that the lens of history shows D.E. Smith to be the foremost figure in terms of his stature.

through distribution of wealths generated therefrom, all at the hands of acclaimed entrepreneur and compassionate humanitarian David Dunham under which pseudonym Smith wrote; one can only assume that this most unusual (and in some ways unique) monograph exorcised the need to produce such a work as a cathartic episode which, if nothing else, unveils the ambit of his mind and no little talent as a writer.

It is apt to bring this essay to a close with a quote or two from Smith's colleague C.J. Keyser who, writing in 1927, made an impassioned point about many who were in charge of education at the time. He began with the lead-in

> "... There is a very great difference between a state of mind and a conviction. Everybody has states of mind but not many people have convictions. Those who have convictions have only a few of them, and the reason is plain—convictions are hard to win.
>
> States of mind are for the most part induced in us by the sentiments and faiths of the household, the neighborhood, and the family newspaper. We derive our states of mind from the social atmosphere by a kind of cerebral suction. But a conviction is a result of hard, patient, and honest thinking—the rarest activity of man. Honest thinking is attended by serious doubt. ..." [9, pp. 28–29],

and stated, rather pointedly,

> "... education is mainly controlled and administered by incompetents; men and women who, because they have never *earned* a grave conviction, have none but are not aware of it; by mere opinion-bearers, who have never been quickened by the pure *spirit* of knowledge but are not aware of their estate." (p. 30);

this rings true now to an extent one may argue, but a lack of conviction—in the unambiguous manner delineated by Keyser—is incontrovertibly not something that could ever be levelled at David Eugene Smith.

> *"If I were to pick out an epitaph to sometime be carved upon my tombstone, I think I should pick out these ... words—"Always to learn, or to teach, or to write—these things have been my delight.""*
>
> D.E. Smith (1926)[12]

Appendix: Dedication to David Eugene Smith (*Osiris*, Vol. 1 (1936))

The following appeared in the said volume (see pp. 5–8), penned by editor George Sarton (and dated August 5th, 1935)—it is first-hand evidence of the respect and admiration that Smith was shown:

> "Dear Dr. SMITH,
>
> It is my fondest privilege as editor of this Volume to present it to you, in the name of the associate editors, and of thirty-six distinguished contributors: your colleagues, friends, and admirers, and many of them, your disciples.
>
> The occasion of this Presentation is your seventy-sixth birthday which we all hope will be followed by a good many others as happy as this one.
>
> The cause of this Presentation is your own wonderful activity extending over almost half a century.
>
> Our purpose is to honor you as a teacher, author, editor, collector, organizer, Maecenas and friend—all of those diverse activities being centered upon the study of the History of Mathematics.
>
> You have been one of the first teachers of the subject in America, and from the very beginning you took that teaching in very deep earnest. It was not for you an empty and frivolous "side-show". On the contrary, you gave to it at once and continued to give to it a good deal of your energy and enthusiasm, and gradually almost everything

[12] Smith's own words [55, p. 278].

you did was directly or indirectly concerned with those studies. For example, you have travelled all over the world, visited every continent, the main nations of East and West, almost every center of culture in the world, but wherever you went you remained first of all the Historian of Mathematics, and you never came back empty-handed. Your library contains memorials—in the form of books, manuscripts and instruments—of every one of your journeys.

You have written a large number of papers and textbooks devoted to our studies, textbooks which are to-day among the main tools for the teaching of the History of Mathematics in the English-speaking world and even outside of it. The bibliography of these writings, . . . , speaks for itself.

In 1923, you started a movement which led to the creation on January 12, 1924 of the *History of Science Society*, which has become by far the largest and the most important society of its kind in the world. Though a majority of its members are Americans, other members may he found in every civilized country. It is not too much to say that almost every scholar who is *genuinely* interested in the history of science is a member of that Society, which you created, and in addition to those individual scholars the main Libraries of the world are registered on its rolls.

Finally, in 1931, you presented to Columbia University the unique collection of books, manuscripts, medals, and instruments, illustrating the History of Mathematics to the building of which you had devoted forty years of your life. Thus your beneficent activities will continue forever, for the *David Eugene Smith Library* will remain a center of information and of research, the very presence of which will forward our beloved studies and stimulate the scholars of to-day—young or old—and those of tomorrow and forever afterward to make new efforts.

The great value of your Library and collection is proved in this very volume, for many contributions were prepared in its welcoming rooms, and other contributors obtained from it some of their best material.

In the name of every contributor to this Volume, I have the honor, dear Dr. SMITH, to present it to you, together with our best wishes, and the testimony of our admiration, gratitude and love."

Authors' Biographies

The authors studied for their B.Sc. Mathematics degrees together at the University of Hull (awarded 1984).

Professor Peter Larcombe started his academic life as an applied mathematician (Ph.D. in fluid mechanics (University of Hull, awarded 1988); postdoctoral research in robotic engineering modelling (University of Glasgow, 1989–1993)), before joining the University of Derby in 1993 where he developed an interest in more analytical work (involving, in essence, the creation/identification and solution of a variety of mathematical problems within combinatorics and discrete mathematics) and in 2013 became the founding Professor of (Discrete and Applied) Mathematics at the institution; Peter, who in recent years has written about historical figures in mathematics, has an Erdős Number 2.

Dr. Gurlat Singh gained an M.Sc. in theoretical mechanics (University of East Anglia, awarded 1985) and a Ph.D. in computational combustion (Cranfield University, awarded 1990). Since 1998 he has been employed in the aerospace industry—simulating and modelling fuel control and actuation systems—having previously worked as a postdoctoral researcher in wave energy devices at the University of Loughborough (1994–1995).

References

[1] F. E. Brasch, Discussion: Honor bestowed on Dr. David Eugene Smith by the Shah of Persia, *Sci.* (New Series) **78** (Issue No. 2026), 384 (1933).

[2] F. E. Brasch, Obituary: David Eugene Smith (an appreciation), *Sci.* (New Series) **100** (Issue No. 2595), 257–259 (1944).

[3] F. E. Brasch and L. Hudgens, The History of Science Society and the David Eugene Smith Festschrift, *Sci.* (New Series) **83** (Issue No. 2158), 424–426 (1936).

[4] E. F. Donoghue, In search of mathematical treasures: David Eugene Smith and George Arthur Plimpton, *Hist. Math.* **25(4)**, 359–365 (1998).

[5] E. F. Donoghue, Smith, David Eugene (1860–1944), Encyclopedia.com: *https://www.encyclopedia.com/education/encyclopedias-almanacs-transcripts-and-maps/smith-david-eugene-1860-1944.*

[6] W. B. Fite, David Eugene Smith, *The Amer. Math. Month.* **52(5)**, 237–238 (1945).

[7] B. M. Frick, Bibliography of the Critical, Historical, and Pedagogical Writings of David Eugene Smith, *Osiris* **1**, 9–78 (1936).

[8] B. M. Frick, The David Eugene Smith mathematical library of Columbia University, *Osiris* **1**, 79–84 (1936).

[9] C. J. Keyser, Convictions and states of mind, *Mole Philosophy and Other Essays*, E.P. Dutton and Co., New York, 28–31 (1927).

[10] P. J. Larcombe and R. J. Wilson, On mathematical culture and community: imagery of David Eugene Smith, 1911, *Palest. J. Math.* **12(3)**, 676–680 (2023).

[11] D. R. Murray, *A Cabinet of Mathematical Curiosities at Teachers College: David Eugene Smith's Collection*, Docent Press, Boston (2013).

[12] J. J. O'Connor and E. F. Robertson, David Eugene Smith, *MacTutor* (University of St. Andrews, Scotland): *https://mathshistory.st-andrews.ac.uk/Biographies/Smith_David/.*

[13] W. D. Reeve, Editorial: David Eugene Smith, *The Math. Teach.* **37(6)**, 278–279 (1944).

[14] W. D. Reeve, David Eugene Smith, *Script. Math.* **11(3–4)**, 209–212 (1945).

[15] S. R. Refior, From the shelves of Dr. David Eugene Smith's unique mathematical historical library, *The Math. Teach.* **17(5)**, 269–273 (1924).

[16] G. Schubring, David Eugene Smith: Cortland, New York 1860–New York, New York 1944, *Hist. Int. Comm. Math. Instr.*: *http://www.icmihistory.unito.it/portrait/smith.php*.

[17] L. G. Simons, David Eugene Smith—in memoriam, *Bull. Amer. Math. Soc.* **51(1)**, 40–50 (1945).

[18] D. E. Smith, Biography: Emile-Michel-Hyacinthe Lemoine, *The Amer. Math. Month.* **3(2)**, 29–33 (1896).

[19] D. E. Smith, The American work of the International Commission on the Teaching of Mathematics, *The Math. Teach.* **2(2)**, 56–71 (1909).

[20] D. E. Smith, A commentary on the Heiberg manuscript of Archimedes, *The Monist* **19(2)**, 225–230 (1909).

[21] D. E. Smith, The International Commission on the Teaching of Mathematics, *The Amer. Math. Month.* **17(1)**, 1–8 (1910).

[22] D. E. Smith, *The Teaching of Geometry*, Ginn and Co., Boston (1911).

[23] D. E. Smith, The geometry of the Hindus, *Isis* **1(2)**, 197–204 (1913).

[24] D. E. Smith, Certain problems in the teaching of secondary mathematics, *The Math. Teach.* **5(3)**, 161–179 (1913).

[25] D. E. Smith, The journal "Isis", *Sci.* (New Series) **41** (Issue No. 1047), 132–133 (1915).

[26] D. E. Smith, Arithmetic in high schools, *The Math. Teach.* **8(3)**, 115 (1916).

[27] D. E. Smith, John Wallis as a cryptographer, *Bull. Amer. Math. Soc.* **24(2)**, 82–96 (1917).

[28] D. E. Smith, A note on de Morgan's *Budget of Paradoxes*, *The Monist* **27(3)**, 474–477 (1917).

[29] D. E. Smith, On the origin of certain typical problems, *The Amer. Math. Month.* **24(2)**, 64–71 (1917).

[30] D. E. Smith, Vocational courses in mathematics for secondary schools, *The Math. Teach.* **10(4)**, 179–180 (1918). [This report seems to be attributed to Smith himself; he apparently wrote a summary of his own address in the third person singular past tense]

[31] D. E. Smith, Introductory courses in mathematics, *The Math. Teach.* **11(3)**, 105–114 (1919).

[32] D. E. Smith, The first work on mathematics printed in the new world, *The Amer. Math. Month.* **28(1)**, 10–15 (1921).

[33] D. E. Smith, Computing jetons, *Numis. Not. Mono.* **9**, 1–70 (1921).

[34] D. E. Smith, New information respecting Robert Recorde, *The Amer. Math. Month.* **28(8/9)**, 296–300 (1921).

[35] D. E. Smith, Certain mathematical ideals of the junior high school, *The Math. Teach.* **14(3)**, 124–127 (1921).

[36] D. E. Smith, *Religio mathematici*, *The Amer. Math. Month.* **28(10)**, 339–349 (1921). [This essay was also published elsewhere in the same year—see *The Math. Teach.* **14(8)**, 413–426]

[37] D. E. Smith, The next step in content in junior high school mathematics, *The Math. Teach.* **15(1)**, 26–27 (1922).

[38] D. E. Smith, Historical-mathematical Paris, *The Amer. Math. Month.* **30(3)**, 107–113 & **30(4)**, 166–174 (1923).

[39] D. E. Smith, Suggestions on the arithmetic question, *The Math. Teach.* **18(6)**, 333–340 (1925).

[40] D. E. Smith, The call of mathematics, *The Math. Teach.* **19(5)**, 282–290 (1926).

[41] D. E. Smith, The poetry of mathematics, *The Math. Teach.* **19(5)**, 291–296 (1926).

[42] D. E. Smith, Was Paul Guldin a plagiarist?, *Sci.* (New Series) **64** (Issue No. 1652), 204–206 (1926).

[43] D. E. Smith, Esthetics and mathematics, *The Math. Teach.* **20(8)**, 419–428 (1927).

[44] D. E. Smith, Introduction to the infinite, *The Math. Teach.* **21(1)**, 1–9 (1928).

[45] D. E. Smith, The form of the universe, *The Math. Teach.* **21(2)**, 107–110 (1928).

[46] D. E. Smith, The lesson of dependence, *The Math. Teach.* **21(4)**, 214–218 (1928).

[47] D. E. Smith, Time in relation to mathematics, *The Math. Teach.* **21(5)**, 253–258 (1928).

[48] D. E. Smith, Note on a greek papyrus in Vienna, *The Amer. Math. Month.* **39(7)**, 425 (1932).

[49] D. E. Smith, *The Poetry of Mathematics, and Other Essays*, Scripta Mathematica, New York (1947 reprinted edition) (1934).

[50] D. E. Smith, Sir Thomas Little Heath, *Osiris* **2**, iv–xxvii (1936).

[51] D. E. Smith and C. C. Eaton, Rithmomachia, the great medieval number game, *The Amer. Math. Month.* **18(4)**, 73–80 (1911).

[52] D. E. Smith and J. Ginsburg, Rabbi Ben Ezra and the Hindu-Arabic problem, *The Amer. Math. Month.* **25(3)**, 99–108 (1918).

[53] D. E. Smith and V. Sanford, A great mathematician as a school boy, *The Math. Teach.* **14(7)**, 362–366 (1921).

[54] F. J. Swetz and V. J. Katz, Mathematical treasures—the David Eugene Smith collection, *Conv.* (January 2011).

[55] C. B. Upton, Dinner in honor of Professor David Eugene Smith, *The Math. Teach.* **19(5)**, 258–281 (1926).

"Nonsense. History is a deep scholarly endeavor, not mere nostalgia. No, it is not serious math; it is history of serious math."

Reuben Hersh (2017)[13]

Author information

Peter J. Larcombe, Department of Computing and Mathematics, College of Science and Engineering, University of Derby, Kedleston Road, Derby DE22 1GB, U.K.
E-mail: p.j.larcombe@derby.ac.uk

Gurlat Singh, Rolls Royce Control Systems, 5000, Solihull Parkway, Birmingham B37 7YH, U.K.
E-mail: gurlat.singh@rolls-royce.com

Received: October 22, 2023.
Accepted: December 23, 2023.

[13] B. Sriraman, An interview with Reuben Hersh, *in* B. Sriraman (Ed.), *Humanizing Mathematics and Its Philosophy: Essays Celebrating the 90th Birthday of Reuben Hersh*, Birkhäuser, Cham, 1–10 (2017); see p. 7. His answer was given to the suggestion that history of mathematics is often categorised as but popularising mathematics, and as such—not being a serious discipline—should be regarded as more a segway into nostalgia. Hersh (1927–2020)—an American mathematician and academic best known for his writings on the nature, practice and social consequences of mathematics, and whose thinking and resulting publications both challenged and complemented mainstream mathematical philosophy—would, we feel, have very much approved of the professional motivations and activities of D.E. Smith as a pioneer who willingly took on the role of fulcrum on which the lever of transition turned to free up the rock of educational inertia at a crucial time in American history.