Oene Bottema was born on Christmas Day, 1901, at Groningen, the capital of the northermmost province of the same name in The Netherlands. His father was a railway official and perhaps that is why in his later life the son took special pleasure in traveling by train. Oene (oe has to be pronounced u, as in rule) is a truly Frisian name as is the case with the patronymic. In fact, Oene belongs to the 10th generation of a family of Bottema's living in Friesland, the province right to the west of Groningen. Its origin can be traced as far back as 1600 to a common ancestor called Botte, a Christian name which is in use until today, especially in Friesland. In the course of years the patronymic has been derived from Botte by means of the suffix ma (a = å as in father) frequently occurring in Frisian surnames. The linguistic meaning of ma is obscure.

In the first half of the 20th century, the province Groningen had a definite agrarian character, the principal products being wheat, barley, oats, potatoes and rye. The capital town with its rapidly growing population (60,000 in 1900, 100,000 in 1927 and 165,000 today) was prospering as an important trade and manufacturing center. Its corn exchange was widely known. To the rest of The Netherlands the inhabitants of town and province were known as honest, earnest, taciturn, hard-working people with a realistic, practical outlook on life. Bottema, who has a word for all occasions, once referred to those traits of characters by stating, “If we are permitted to choose between roses, lilies and apples, we take the apples”.

Groningen, the town, is and has always been an important center of arts and sciences. Its University was founded in 1614. It was this University where Johannes I. Bernoulli received his first professorship. He held the chair of mathematics from 1695 to 1705. The famous Dutch astronomer Jacobus Cornelius Kapteyn (1851–1922) worked here. The Nobel prize winner in physics, Fritz Zernike, held the chair for mathematical and technical physics during the years 1920–1958. It must be said that in the first three decades of our century, the townspeople were not free from certain class prejudices and there were rather strict rules as to what was remitted by a member of this or that class and what was not permitted.

This is, in short, the setting in which the man who will play the leading part in this paper started his career. After he had finished the primary school, his parents decided to send him to the HBS, a secondary teaching institution. Some explanation will be necessary. The acronym stands for Hogere Burgerschool (Higher Citizens' School in a literal translation borrowed from H. B. G. Casimir†). This type of school had been instituted in 1863. The HBS with its 5-year courses was intended to prepare its pupils for industry and business. The curriculum included mathematics, science and four modern languages—Dutch, English, French and German. Its certificate did not qualify for admission to University examinations because—in contradistinction to the gymnasium—neither Latin nor Greek was taught. The HBS of Bottema's youth was populated by the children of well-to-do citizens, notables, clergymen, civil servants of a somewhat superior rank and the like. A regrettable consequence was the general opinion that visiting the HBS was a prerogative reserved only for children of a certain social élite.

Perhaps the above will be of some help in understanding how the intention of father and mother Bottema as to their son's future could raise some commotion in the family. The words, “Oene at the HBS?” with a big and clearly audible questionmark could be heard. This was “unusual”, “grasping too high”, in short, it was “not done by our kind”. But father Bottema and his wife stood firm and Oene entered the HBS at Groningen, a highly reputed teaching institution. Some explanation will be necessary. The acronym stands for Hogere Burgerschool (Higher Citizens' School in a literal translation borrowed from H. B. G. Casimir†). This type of school had been instituted in 1863. The HBS with its 5-year courses was intended to prepare its pupils for industry and business. The curriculum included mathematics, science and four modern languages—Dutch, English, French and German. Its certificate did not qualify for admission to University examinations because—in contradistinction to the gymnasium—neither Latin nor Greek was taught. The HBS of Bottema's youth was populated by the children of well-to-do citizens, notables, clergymen, civil servants of a somewhat superior rank and the like. A regrettable consequence was the general opinion that visiting the HBS was a prerogative reserved only for children of a certain social élite.

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years were very important for his further life and, incidentally, not in the least for the school because the newly appointed turned out to be a brilliant teacher. It was in Hengelo that Bottema's scientific qualities were discovered by Dr W. van der Woude who visited the school as a member of a committee charged with the supervision of the final examinations. van der Woude was a geometer who held a chair of mathematics at the University of Leyden. He had a deep knowledge of theoretical kinematics and mechanics and his name was well known to anyone working in this field. van der Woude stimulated Bottema to write a doctoral thesis. To make a long story short: the result was that Woude acting as his promoter, i.e. as the professor presenting him for his degree. The subject of the thesis, entitled De figuur van vier kruisende rechte lijnen (The Figure Consisting of Four Mutually Skew Lines) was purely geometric.

So much for the events of an educational or scientific character. Now for the human factor. Bottema fell in love with and became engaged to Femmy Berendsen. She was two years his junior and seven years older than her sister who was at the time one of Bottema's pupils. The marriage took place in 1930 at Hengelo. In 1931, Bottema was appointed to the staff of the State HBS at Groningen, the school of his youth. In 1933, he was nominated Head (Director) of the State HBS at Sappemeer, a village near Groningen, and in 1935 he became Head of the State HBS at Deventer, a town in the same province (Overijssel) as Hengelo.

Bottema's scientific qualities had already found recognition by the fact that he had obtained permission to act as a privaats-docent (i.e. as an unsalaried external university lecturer). He was a privaats-docent at the University of Groningen and Leyden respectively from 1931 to 1935 and 1937 to 1940. The year 1941 saw him appointed to professorial rank at the Technological University Delft (Dutch: Technische Hogeschool Delft, TUD for short) with the commission to teach Pure and Applied Mathematics and Theoretical Mechanics. Bottema and his wife with their two children (a daughter born at Groningen and a son born at Deventer) moved to Rijswijk, a village half-way between The Hague and Delft. According to custom, a newly appointed professor enters upon his duties by delivering a public address, his inaugural oration. I shall not dwell here on the contents of this oration. One point in it, however, is worth mentioning because it sheds light upon Bottema's character. It was wartime and our country lived under German occupation. Bottema had the courage to praise in public Professor D. van Danzig, a Jewish-Dutch mathematician of international fame who had been dismissed sometime before by the Germans. Because of the war and its aftermath, it was not until 1950 that the Bottema family obtained suitable housing in Delft. It was here that Bottema came to the full development of his faculties. The TUD had appointed Bottema as its Rector Magnificus (the equivalent of vice chancellor) from March 1951 to September 1959. He handled the management of the University with its numerous intricacies as if he had been born to it. Meanwhile he acquitted himself of his teaching and examination duties and found the time to write 45 papers on various scientific subjects. He had the good fortune to be a gifted orator. This enabled him to cope in an admirable way with the many representative duties the rectorship involved. In recognition of his work, Bottema received many distinctions. In 1954, he was made Officier de l'Académie Française. The Dutch government bestowed on him the distinction of Ridder (Knight) in the Order of the Nederlandsse Leeuw (1955). From the University of Leeds he received in 1958 the degree of Doctor of Laws, honoris causa. In 1959, he became an honorary member of the Dutch Mathematical Society. In the same year Bottema delivered his final rectoral oration and resigned that office. The government bestowed on him the very high distinction of Commander to the Order of Orange Nassau. Thereafter, Bottema devoted his time to his teaching duties and to scholarly work in mathematics and kinematics. He retired in 1971 with a valedictory address entitled, Afscheid van een stand van zaken (A Farewell to a State of Affairs). The municipal corporation awarded him the medal of honor in gold of the town of Delft, a rare distinction.

In the course of their marriage, his wife Femmy was a great help to Bottema. During their residence at Delft, the first signs became manifest that Femmy suffered from a serious disease. The best available medical care could not prevent her gradual dependence upon a wheelchair. Femmy was a courageous lady of considerable willpower and a stranger to self-pity. The devotion of her husband found expression in his affectionate care of her. I respect Bottema for his intellectual qualities but my wife and I and many others with us admire him for all he did for Femmy. Her death in 1981, although not unforeseen, was a heavy blow to Oene and a serious loss to her many friends.

EDUCATIONAL AND SCIENTIFIC WORK

ESPECIALLY IN KINEMATICS

Apart from book reviews and articles in the daily or weekly press, Bottema's writings (up to the present) involve 322 books and articles, the latter ranging from short notes to lengthy articles. He contributed over 300 problems to the Problem Section of the Nieuw Archief voor Wiskunde, the journal of the Dutch Mathematical Society. His papers can be divided in two classes: those of a purely scientific nature and others in the educational vein. To the latter belong all papers in a series of 100 with the collective name Verscheidenheden—mostly short notes on a diversity of subjects chosen from elementary
mathematics and mechanics. They were published in *Euclides*, the journal of the Dutch Society of Teachers of Mathematics, which elected Bottema one of its honorary members. The Dutch word *Verscheidenheid* means variety. Perhaps Bottema had the proverb, "Variety is the spice of life" in mind when he started the collection in 1945.

His scientific papers are mostly on geometrical and kinematical subjects but there are also papers on algebra, analysis and the calculus of probabilities. They appeared in numerous leading journals. At the end of this article the reader will find a complete list of Bottema's papers on kinematics and mechanics in their order of publication. An asterisk means that the paper is in Dutch whereas the abbreviation *Versch.* followed by a number in Roman capitals indicates a *Verscheidenheid*. A second list contains all his books. In the following commentary, I refer to an item on the first or second list by its number preceded by a *P* or *B*, respectively. List I shows 99 items among which 46 refer to kinematics. Bottema did not begin publishing on kinematics before he was a professor at the TUD, the first paper being P5. We find 15 papers on kinematics dated between 1944 and 1960. I mention P13, in which he presents the first satisfying definition of the concept of Cardan position. In the field of theoretical kinematics, 1961 is an important year: it saw the birth of the instantaneous invariants (P471) and it was the year in which Bottema and Freudenstein discovered each other. The list shows 17 papers in the period 1960–1971. In my opinion, P54, P65 and P77 are of outstanding quality and must be considered as a prelude to B8. The same holds for some of the 14 papers on kinematics our honoree has written after his retirement in 1971.

**BOOKS ON MATHEMATICS, MECHANICS AND KINEMATICS**

List II opens with four items on geometry. Item B1 has already been mentioned in the first section of this article. B2 gives a beautiful account of elementary plane geometry starting with its foundations and pursuing the subject in detail. The book is the fruit of Bottema's activities as a *privaat-docent* at the Universities of Groningen and Leyden. The next item is a war edition. It is a little pocket-sized booklet with an astonishingly rich content. It treats, as the title *Chapters From Elementary Geometry* suggests, various topics from elementary geometry. B4 is known to experts in the matter as the Bottema Bible. It is a systematic collection of approx. 500 inequalities. Theoretical Mechanics (B5) is a very good book for students in Technology and Physics. B6 gives a lucid account of the Calculus of Variations for prospective engineers. B7 is a short primer on the basic concepts in geometry. Little needs to be said about B8, the fruit of a profound study of theoretical kinematics. To workers in the field, this book will remain the most frequently consulted work during a long period of years.

**BOTTEMA, WRITER AND LITERATOR**

Bottema is an erudite man. He is extremely well-read and has a vast knowledge of history. As to foreign literature, he prefers English and French to German. Reading is to Bottema the breath of life. He enjoys a piece of well-written prose or a beautiful poem like a gourmet enjoys a well-prepared dish. His own non-mathematical papers show that he is a brilliant stylist with an exceptional mastery of the language. It would be a grave mistake to ignore these literary writings for anyone who wants to appreciate Bottema's personality in full. Being well aware of this fact his numerous friends presented him on his seventieth birthday with a book written by himself. It contains a choice of his public addresses and articles in literary journals. The donors found their inspiration for the title: *Steen en Schelp* (stone and shell) in the address of the same name delivered by Bottema on the occasion of the fiftieth anniversary of the TUD. There he tells that he has been inspired by the famous poem, "The Prelude" by William Wordsworth who is one of his favorite poets.

Today Bottema lives as a private citizen in his dearly beloved Delft, still in the same house he and his family moved into in 1952 and still within sight of the Department of Mathematics of the University he served during thirty eventful years. He is not idle. With infinite love for the subject, he prepares a revised and augmented edition of the little jewel B3 of List II. We leave him to this task remembering the advice he once gave in a French lecture: "éloignez-vous sur la pointe des pieds, en chuchotant: c'est le géomètre qui fait son jeu". We depart knowing that on a morning in December when he is smoking his inevitable after-breakfast pipe, the postman will ring to hand him the issue of this Journal dedicated to the man who gave kinematics its much-needed facelift. May he enjoy this tribute of friendship, gratitude and admiration.

**Acknowledgements**—The author wants to express his sincere thanks to Mr Rinze J. W. Bottema and his sister for their help with the Biography; to Mrs Eis Rene, Mrs Aik Flapper and Professor Dr A. W. Grootendorst for their generous assistance in composing the bibliography; and to Rutger Oene for his permission to publish the picture of his grandfather.

**LIST I, PAPERS ON KINEMATICS AND MECHANICS**

2. The center of gravity of a regular three-sided pyramid either as a wire or as cardboard construction. *Christiaan Huygens* 9, 96–101 (1930/31).
450 G. R. VELDKAMP


60. On Staude’s motion in four-dimensional space. Nieuw Arch. Wisk. (3) 14, 1–6 (1966).
Oene Bottema: a biographical sketch


LIST II, BOOKS

2. De elementaire meetkunde van het platte vlak, Groningen (1938).