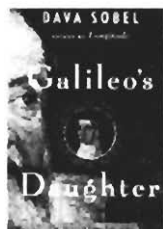


To Move or Not to Move

Biman Nath



Galileo's Daughter
by Dava Sobel
Penguin Books
2000, p. 420, Price: \$14

Our penchant for punchlines often paints our stories in black and white. Shades of grey in life often do not exist for us. But it is these grey shades which can bring a story to life.

We have all heard the famous story of Galileo's muttering under his breath after his trial in Rome, that 'the earth still moves'. But it is not often that we get an opportunity to reflect upon the dilemma faced by him, as he tread 'a dangerous path between the Heaven he revered as a good Catholic and the heaven she revealed through his telescope'. We often wonder that if Galileo was 'the father of modern science', as Einstein once said, then what made him capitulate at the papal court, trying all kinds of verbal tricks to convince the inquisitors that he did not really believe in the Copernican system, although his telescope was telling a different story.

We often forget that scientists are also human beings, that they are also a part of the society. Dava Sobel drives this point home with her poignant story of Maria Celeste, the eldest daughter of Galileo, and through the letters between them, telling the story of Galileo and

the 17th century Italy and Europe. This new book does not add any bits of history or of Galileo's life that is not there in any other book. But what the writer has achieved by her excellent sense of story telling is a moving picture of a scientist torn between beliefs and truth. Although the focus of the book is on Galileo's relation with his eldest daughter, it is an excellent biography of the scientist, full of insights into various factors that shaped his life and science.

Virginia, Galileo's eldest daughter, was an illegitimate child, born out of the illicit relationship between Galileo and Marina Gamba of Venice. It was usual for such daughters, who could not be married off later, to be put into convents in the 17th century Italy. Virginia took up the name of Suor Maria Celeste – obviously keeping in mind her father's passion for the starry heavens – when she took the oath at the convent at the age of thirteen. There she spent twenty years in poverty and often in sickness, but never lost touch with her father, whom she revered and loved enormously.

The surviving 124 letters from her to Galileo form the core of Sobel's book (his replies were probably destroyed by the abbess, as Galileo was not looked upon favourably by Vatican in his later years). These candid letters give an intimate glimpse of life in the 17th century Italy. Through them we get to know that she used to bleach her father's collars, often copied the pages of his forthcoming books, or made his favourite candies from lemons and oranges he sent her from his garden. She fretted over

his health when he was languishing in Vatican, waiting to be summoned by the papal court, and wondered about the ecclesiastical politics. Galileo was also very fond of her, and once wrote about her as “a woman of exquisite mind, singular goodness, and most tenderly attached to him”.

After a few chapters on the early life of Galileo, the book quickly moves on to the climactic pages of the famous trial in Vatican. Sobel prepares the reader by introducing the important people in Vatican, people with animosity towards Galileo, and people in his favour. She wonderfully paints the background history of Europe at that time and we realise how Galileo fell victim to the vagaries of European politics of that era. Pope Urban VIII, who was initially friendly towards Galileo, later felt compelled to make the trial of Galileo an example of his tough stance towards anyone raising any doubts about Catholicism. This is because he fared badly in the politics behind the Thirty years war, and wanted this trial to bolster his position as the protector of Catholicism. Although many biographies talk about two trials of Galileo, Sobel shows that there was only one. In her words, “there was only one trial of Galileo, and yet seems there were a thousand – the suppression of science by religion, the defense of individualism against authority, ... No other process in the annals of canon or common law has ricocheted through history with more meanings, more consequence, more conjecture, more regrets.” And she convincingly shows that it was impossible for Galileo

to have muttered the famously quoted phrase in his trial.

The period when he was under a house arrest that ensued from this trial was equally important from the point of view of modern science. It was then that he restarted his old research on how things moved. He experimented with balls rolling down inclined planes, timing them with crude clocks, and carefully noted his results. And this is what gave birth to modern physics later, in the hands of Isaac Newton. As a matter of fact, Galileo’s insistence on trying to learn ‘how’ things moved, as opposed to the Aristotelian insistence on ‘why’ things moved, signalled the birth of modern science. Not pure logic, but careful observations of the real world could yield the mysteries of Nature. As Einstein once wrote, “propositions arrived at purely by logical means are completely empty as regards reality. Because Galileo saw this, and particularly because he drummed it into the scientific world, he is the father of modern physics – indeed of modern science.”

As if the punishment of the house arrest was not enough, old and blind Galileo almost broke down when he heard the death of Maria Celeste (at the age of 33). He wrote to a family friend that an ‘immense sadness and melancholy’ had over powered him, that he heard his daughter calling to him continually and he had lost his appetite. Galileo wrote to his student, “I spend my fruitless days which are so long because of my continuous inactivity and yet so brief compared with all



the months and years which have passed; I am left with no other comfort than the memory of the sweetness of former friendships." Dava Sobel endearingly writes about the special friendship he had with Maria Celeste, whom he used to send 'special spinach dishes' that he cooked himself, or worry about the windows in her room in the nunnery and fitted the frames with newly waxed linens. And write to her about the new discoveries he was making, the hostilities he felt among his adversaries and the searing dilemma he faced in reconciling his science with religion.

Unlike any other biographies, this book gives a close up of the mind of this great scientist,

who while "teaching discovering new phenomena among the planets was also buying thread for Suor Luisa, supplying his home grown citrus fruits, wind and rosemary leaves for the kitchen and apothecary at San Matteo." In the end, we are left with a sense of wonder of how much a human being can do in the face of adversity.

Anyone who wants to know what made Galileo the great scientist that he was, must read this book.

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...one or two atoms can convert a fuel to a poison, change a color, render an inedible substance edible, or replace a pungent odor with a fragrant one. That changing a single atom can have such consequences is the wonder of the chemical world. (p. 2)

Chemistry stands at the pivot of science. On the one hand it deals with biology and provides explanations for the processes of life. On the other hand it mingles with physics and finds explanations for chemical phenomena in the fundamental processes and particles of the universe. Chemistry links the familiar with the fundamental. (p. 2)

One of the wonders of this world is that objects so small can have such consequences: Any visible lump of matter - even the merest speck - contains more atoms than there are stars in our galaxy. (p. 4)

Each new atom brings something of the personality of its element to the molecule, and this conspiracy of atoms results in a molecule with properties that are richer than those of each atom alone. (p. 13)

P W Atkins, "Molecules"

W.H. Freeman and Company, New York, 1987.