Anecdotes Can Tell Stories—How? And What is Good and What is Bad about Such Stories?

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ABSTRACT: An anecdote is a short narrative, a 'tall tale' that is interesting, amusing, often based on a biographical incident, commonly acting out a specific historical situation. It is aimed to reveal a truth that is more general than the tall tale itself. The word anecdote comes from Prokopios, 6th century a.d., a historian who wrote a biographical work about the Eastern Roman emperor Justinian I, called 'Anecdota' (commonly translated as 'unpublished memoirs' or 'secret history'). Its content primarily consisted of indiscreet short stories about the Byzantine court.

For historians, however, anecdotes are distorted reductions of history and therefore not deemed worthy to be included in a scholarly work. For writers, in contrast, anecdotes can be a very important stylistic device. How is it with science teachers? I think historians should prepare for them a more profound access to this device than until now existing.

KEYWORDS: Anecdotes, science stories.

An anecdote is a short narrative, a 'tall tale' that is interesting, amusing, often based on a biographical incident, commonly acting out a specific historical situation. It is aimed to reveal a truth that is more general than the tall tale itself. The word anecdote comes from Prokopios, 6th century ad., a historian who wrote a biographical work about the Eastern Roman emperor Justinian I, called 'Anecdota' (commonly translated as 'unpublished memoirs' or 'secret history'). Its content primarily consisted of indiscreet short stories about the Byzantine court.

For historians, however, anecdotes are distorted reductions of history and therefore not deemed worthy to be included in a scholarly work. For writers, in contrast, anecdotes can be a very important stylistic device. Mark Twain once said that an anecdote is defined by 1) the narrator 2) its humanism and 3) by its 'punch line'. I would add: to ensure that this kind of short narrative is easily remembered, the 4th defining factor should be that an anecdote must be a

condensed history. In contrast to an anecdote, in a joke there is not necessarily a humanistic base and generally no historical reference given. In contrast to a literary parable, an anecdote generally does not reveal the truth by the aid of an analogy. The literary parable is defined by using an analogy, which connects two totally distinct fields of subjects. It isn't necessarily short and usually describes no specific historical situation. But my personal belief is that the most memorable stories which are impressive by their literary form, by their content and by the truth they reveal to us, are in fact a combination of an anecdote and a parable.

Unfortunately I don't know any examples from science that have such a profound philosophical background as we find in the following anecdote (the German poet Hermann Hesse tells a variation of this anecdote, according to his own personal view, as found in his 'Kurzgefasster Lebenslauf',1925):

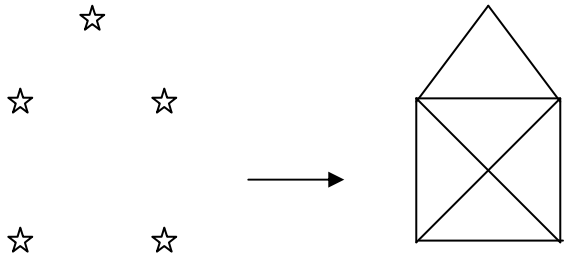
> *The Chinese painter Wu Tao-tzu was famous because he could paint nature in a unique realistic way that was able to deceive all who viewed the picture. At the end of his life he painted his last work and invited all his friends and admirers to its presentation. They saw a wonderful landscape with a romantic path, starting in the foreground between flowers and moving through meadows to high mountains in the background, where it disappeared in an evening fog. He explained that this picture summed up all his life's work and at the end of his short talk he jumped into the painting and onto the path, walked to the background and disappeared for ever.*

Recalling the definition by Mark Twain, we see here:

1) the narrator in a dual form—the one who tells the parable and the painter who tells about the picture. The profound truth of this dual person is this: the more you become absorbed in your own story the more impressive it is for your audience.
2) the humanistic approach—it is an analogy of the peak of creative work and at the same time we perceive the transitoriness of all human achievement. The climax occurs, when the creator becomes totally absorbed in his work that leads to the end of all his work.
3) the punch line—the more surprising this punch line is and the more its humanism impresses us, the easier such an anecdote will stay in our memory. What is still more important, it will be in our subconscious. In literature this subconscious is called the *episodic memory*.

Of course, the best presentation of an anecdote occurs when a teacher can tell an anecdote from his own experience. The following is an anecdote based on my personal experience, which you can possibly define as a parable. I heard it in Bern, Switzerland in 2005, during the Einstein year celebrations there:

The Nobel Prize physicist Murray Gell-Mann, who 'invented' the concept of quarks, told a big audience how he defined creative science: One imagines having to solve a puzzle, for example, the famous one that children play to connect the 5 points on a paper, each one with the other, by straight lines, without interrupting the drawing, and not being allowed to draw a line more than once.



We probably all know the most common solution, but there are others too, as Murray Gell-Mann said. You can fold the paper so that all points lie exactly on top of each other and then make a hole through all the layers with your pen. Why not? The question 'why not' is very important in science. You also may take a thick marker which is as thick as the arrangement of all points is broad and make a thick stroke above the figure.

The analogy here is clear: 1) you need to observe exactly what is demanded by a problem and 2) you need a gift of imagination to find unusual solutions for a proper progress of science.

A similar anecdote is a famous one (you will find different variations in the Internet), often attributed to Niels Bohr—in contrast to the one just told it cannot be verified by historic sources. But I think this doesn't matter in this case. You can attribute it to the *principle* of a creative scientist. But the Niels Bohr story is more impressive—because it has to do with a living being like you and me!

During a physics examination, the student Niels Bohr apparently was asked to 'describe how to determine the height of a skyscraper with a barometer'.

'You tie a long piece of string to the neck of the barometer,' he replied, 'and lower the barometer from the roof of the skyscraper to the ground. The length of the string plus the length of the barometer will equal the height of the building'.

This answer made the examiner angry, so much so that Bohr was demanded to provide a proper answer within six minutes which would show more knowledge of physics.

For five minutes he sat in silence, thinking. At last, he gave this reply:

'You could take the barometer up to the roof of the skyscraper, drop it over the edge, and measure the time it takes to reach the ground. The height of the building can then be worked out from the formula $H = 0.5g \times t^2$. Or, if the sun is shining you could measure the length of the barometer, then set it on end and measure the length of its shadow. Then you measure the length of the skyscraper's shadow, and work out the height of the skyscraper using similar triangles.

You could also tie a short piece of string to the barometer and swing it like a pendulum, first at ground level and then on the roof of the skyscraper. The height is worked out by the difference in the gravitational restoring force, measured by the swinging times.

If you merely wanted to be boring and orthodox about it, you could use the barometer to measure the air pressure on the roof of the skyscraper and on the ground, and convert the difference into feet to give the height of the building. But the best way would be to knock on the janitor's door and say, 'If you would like a nice new barometer, I will give you this one if you tell me the height of this skyscraper!

It is not quite clear if we can really define the two anecdotes mentioned here as parables because the subjects which are connected by an analogy are not totally distinct from one another. In any case I think, these anecdotes can start an association chain in the episodical memory of a student- especially if the teacher adds further interesting explanations (maybe historical stories or reflections connected to theories and laws of science) about what is creative thinking in science.

Often it is enough to start only by asking a question using an anecdote, and not to give condensed answers. In this respect the following is a very good example.

It is a picture, showing Einstein standing before a blackboard. He had just written the formula $E = ma^2$, and immediately afterwards, or may be after some difficult reasoning, $E=mb^2$, and now he is thinking about the next solution. He is clearly very close to the most famous discovery of all time!

But is it an anecdote or only a good joke, because, clearly, there was never a real historic situation like this?

Unfortunately, teachers like to use anecdotes in science lessons, which are distorted, or mythical or/and superficial reductions of history—these are the ones that historians hate. Take the famous anecdote, which generations of historians have tried to eliminate in vain from school textbooks. Galileo found the law of free fall, in Pisa, by letting heavy objects fall from the Tower of Pisa. The fact is that in Pisa he even thought that lead falls faster than wood and said nothing about a mathematical law describing free fall, but when he found the law of free fall, during his time in Padua, it needed a complicated interplay between (partly scholastic) thinking and very different series of experiments.

Not all those anecdotal reductions of history are so totally misleading. But the teacher often likes such big –because short - distortions, for example the one about Isaac Newton and the apple falling on his head that started the process of discovery of his law of gravity.

Instead of anecdotes that distort science history, the teacher can find other real stories. They are equally helpful, although all short stories will necessarily reduce history. In respect to Galileo's kinematics we have to find an anecdote or short story to make this famous name more alive for a school student. Why not (also in pedagogy that 'why not' question is helpful) choose the manuscript sheet 116v of Galileo, for the first time interpreted in 1974, and tell the students:

> *This manuscript sheet 116v is a snap-shot taken from Galileo's laboratory, about which we know almost nothing, as we know nothing about what happened around this manuscript. But we see, in a moment's reflection, a hidden treasure telling us how the great scientist worked, had a very ingenious idea: why not use a jumping hill device for rolling a sphere down the incline? Now it was not necessary for him to measure time because the horizontal distance gave the (horizontal) velocity as a function of the height of fall. He also could study how vertical fall and horizontal movement were connected and some other problems as well.*

There is a very pretty story about Galileo and optics which in principle is true.

> *In the springtime of 1609 Galileo heard of the invention of a miracle tube which enlarged all distant objects. He immediately reinvented this device - a tube of paper with two lenses - but didn't tell that he was not the first inventor. He arranged a presentation of this brand new device to the government of Venice (the 'Signoria'). On a hot day in August 1609 all the old senators climbed, together with him, to the top of the Markus-Tower. They*

looked through this instrument at the sea and everyone was really surprised. They saw ships enlarged which were far away. They even saw ships they could not see with the naked eye. Those which were farthest away needed two hours until they could be seen by the naked eye (question to the school students: why was this last result so important for the state of Venice?). *Galileo got what he had cleverly intended to get, a lifetime position as professor and 100% more salary. In the late autumn of this year he looked with the telescope to the sky. Of course his better position now allowed more basic research - but he did not get any money for that.* (This is not quite true, he was still cleverer—but that is another story).

Clearly, it would be necessary to write a book as a resource of such materials for the teacher. I think there is nothing on the market so far, which was carefully revised (or even produced) by historians. I know only of many wild collections of anecdotes (especially on the Web), without citing the sources or giving any connections to a scientific or historical background.

I am now free to say that anecdotes which cannot be verified by historical sources can also be useful in school. This is illustrated by the 'Niels Bohr' example and by the following one:

A student came to see the physical chemist Wilhelm Ostwald, who had just finished his diploma-work and apologized that he hadn`t found the desired result. Ostwald answered in a dry tone: 'This is still the best of your work'.

This is again theory of science which here will be revealed as a truth for the student. Indeed, at school it is just the opposite of a real research situation: the teacher marks a question and the school student has to get the planned answer –by an experiment or by calculation.

The best advantage of anecdotes, even of historically incorrect ones, is that they tell something about the human factor of science: curiosity, vanity, play, instinct, and generosity, but may show malice or bigotry. They may also say a lot about social factors: teamwork, institutional relations, political surroundings—like nationalism—, and economic interest, as shown in the Galileo-telescope story.

An anecdote which I liked most in this sense—and, not surprisingly attributed to different scientists, the original version comes from Edison—is the following.

A great scientist, e.g. Carl Djerassi (the 'father' of the pill) said, science is of course inspiration, but only 1%, 99% is perspiration. And then he showed a photograph with him and his big team of co-workers. He pointed at himself on the photo and said smiling: this is the 1% inspiration, and then pointed to the many co-

workers: these are the 99% transpiration. (Question to the school students: do you think this is true?)

In any case, an anecdote in science lessons can be the start of a chain of associations. The teacher can (apart from providing material for the episodic memory) test how he will find a bridge from hard core physics to the emotional interest of the students and, how long the bridge should be. The bridge itself has to be built by stones represented by longer, more profound stories—not necessarily historical ones.

Conclusion

Anecdotes can share experience from the past—something that may have happened weeks ago or centuries ago. They will develop visual pictures in the brains of young students. They are also bridges in several dimensions—between past and present, between emotion and reason, between episodic and analytical knowledge, and between aesthetics and scientific truth. Indeed, stories out of the life of the teacher himself can have similar effects. But students themselves should also be encouraged to tell stories. The best effect of a story told in school happens when a student will retell the story at home, to friends, maybe even to strangers. A bad effect would be when he only remembers the teacher as a storyteller.

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Appendix: Galileo Manuscript sheet 116v