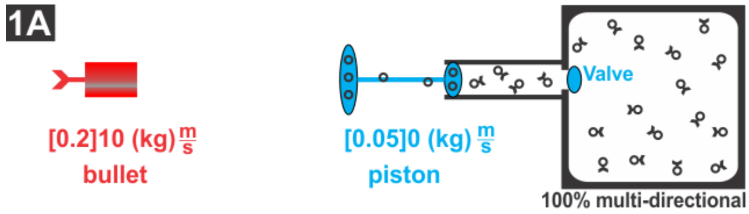

Gas Collisions Connect Heat and Atomic Momentum

Professor Du-Ane Du

www.Wacky1301SCI.com, *"Looking at serious science, sideways!"*

Three sisters, Pico, Hectii, and Tera, the "Space-sci Sherlocks," are traveling through the Asteroid Belt. They use gas collisions to examine the relationship between heat, atomic momentum, and kinetic energy.
—Excerpted from *Murdered Energy Mysteries*, Part 3, Chapter 6, by Du-Ane Du, (Amazon, Kindle, ebook 2018, paperback 2021).

"Pico's idea of different views of atomic motion is interesting," Hectii confided. "But is that true for all substances? Do fluids perform the same way?"

"I can simulate any type of experiment you wish to perform."

“I’ll need a gas chamber of fixed volume,” Hectii instructed. “A large piston attached to one end of the gas chamber with a one-way valve that’ll allow gas to flow from the piston into the chamber. And I’ll need a plastic bullet, about the size of my fist, with a mass of…0.2 kg, and a bullet launcher.”

“I take it you plan to launch the bullet at the piston?” Chip said, as he prepared the equipment. A bullet launcher appeared to Hectii’s virtual left.

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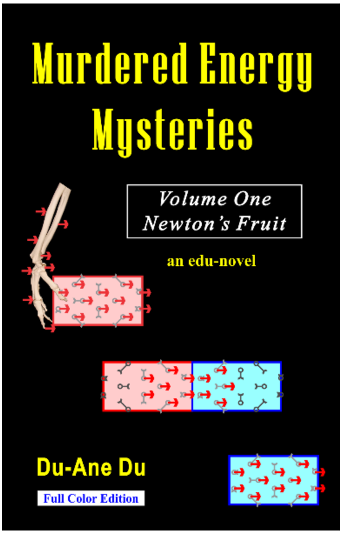

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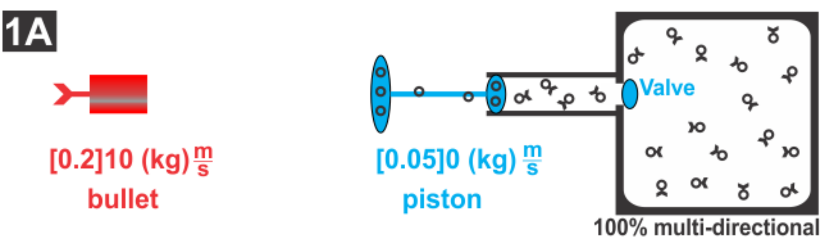
“Exactly,” Hectii said, as she nimbly turned the launcher’s virtual control-dial to 10 m/s. She pulled the piston outward until it was full of gas, and set the valve so it would close once the piston stopped compressing. She aimed the launcher at the piston.

“Chip, record the side view so I can see the atoms of gas moving inside the chamber,” Hectii said. She hit the launch button, and the bullet flew toward the piston. The bullet hit the piston, the piston compressed, and the gas squirted into the gas chamber. The bullet came to a stop, and the valve closed with about 10% of the gas remaining in the piston. "You designed that perfectly, Chip."

"Thank you," Chip said. "Which view would you like to examine first? I should note that our focus is on the direction and relative speed of the atoms in the gas chamber—so my illustrations won't be to scale, and the number of atoms pictured won't necessarily be related to the actual gas density."

"That's fine," Hectii said. "Show me what was happening just before the bullet struck the piston."

"Here:"



"I like the short-cut notation method you're using for the motion data. It's telling me the bullet has a mass of 0.2 kg, and a speed of 10 m/s," Hectii said approvingly. "Let's focus on the gas first. The atoms are moving in all directions. The motion is multidirectional and completely random."

"What about Pico's dream?" Chip said.

"Good point," Hectii said. "At the invo-atomic level the gas atoms are moving randomly. At the exvo-atomic level the atoms of gas are also moving randomly—because that's the view I would have. But at the solar-atomic level, the atoms will be moving forward in a semi-aligned pattern. And the same thing is true at the galactic level, the atoms are moving forward very fast, but the speed and direction are fluctuating… this is hard for me to visualize."

"Imagine for a moment that you and your friends are all sitting on a merry-go-round that's on top of a train," Chip said. "The train is moving forward at 200 000 m/s, and at the same time the merry-go-round is rotating."

Hectii tilted her head as she visualized, "And now and then the kids are running from one horse to another. That's a good image of how the multi-directional motion of gas atoms at the human level can be viewed as semi-aligned motion at the galactic level."

"Good, what about the bullet's motion?"

"The atoms in the bullet are very close together, and they have semi-aligned atomic motion vectors," Hectii recounted. "Before we move to the next picture, I should calculate the starting momentum. Put a data box below the picture, so I can do some calculations."

"Do you want to use the solar and galactic data from Pico's dream?"

"About how fast is Earth traveling as it orbits the sun?" Hectii said.

"Around 30 000 m/s."

"And how fast does our solar system travel as it orbits around the center of the Milky Way Galaxy?"

"Well over 200 000 m/s."

"Let's use those numbers," Hectii decided, as she activated the keys on her data-input gloves. "As I key, place my information in table format, and put it in a display box on the left side of my 3D viewer. Based on our three velocity perspectives, the four views of our bullet's atomic momentum will be:"

Initial s-Momentum Data

	motion data	**s-momentum**
Invo-atomic	$[0.2\ kg]?\ m/s$	**?** ρ
Exvo/human	$[0.2]10\ (kg)\frac{m}{s}$	**2** ρ
Solar view (+30 000 m/s)	$[0.2]30\ 010\ (kg)\frac{m}{s}$	**6 002** ρ
Galactic view (+200 000 m/s)	$[0.2]200\ 010\ (kg)\frac{m}{s}$	**40 002** ρ

"I used red for the data in the most important column. I should also calculate the energy (speed infused impulse) associated with the atoms inside the bullet," Hectii said, as she keyed in the following data:

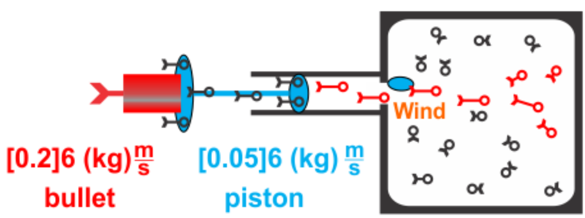
Initial Kinetic Energy Data		
	motion data	**KE**
Invo-atomic	[0.2]?	**? joules$_{[IC]}$**
Exvo/human	$1/2[0.2]10^2$	**10 J$_{[0.1]}$**
Solar view (+30 000 m/s)	$1/2[0.2]30\ 010^2$	**~90 060 010 J$_{[\mu]}$**
Galactic view (+200 000 m/s)	$1/2[0.2]200\ 010^2$	**~4 000 400 010 J$_{[\mu]}$**

"You're doing well," Chip said.

"Thanks, now we need to see what happened as the bullet struck the piston."

"Here's a picture of the start of the collision," Chip said, as he placed the following on her 3D virtual display:

1B



"I see several atomic interfaces that're actively transferring the momentum from one object to another," Hectii said mathematically. "On the left side of the piston there's a bullet/piston atomic interface, and on the right side of the piston there's a piston/gas atomic interface."

"There's at least one more atomic interface," Chip said. "As the gas atoms leave the piston, they form a wind. The wind atoms have semi-aligned exvo-atomic motion vectors similar to the motion vectors inside the bullet. The third atomic-interface is between the wind atoms and the no-wind atoms."

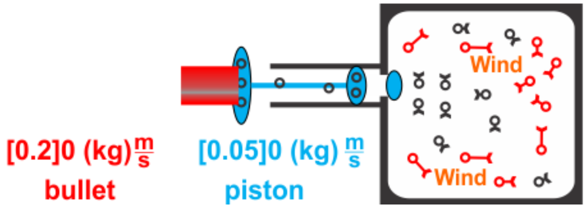
"And momentum is being transferred across all three of the atomic-interfaces," Hectii asserted. "At the bullet/piston atomic interface, there's a contac- ρ-force-rate that's transferring momentum from the bullet to the piston."

"Good," Chip said. "What else?"

"At the piston/gas atomic interface, the force-rate is transferring exvo-atomic momentum from the atoms on the surface of the piston to the atoms of gas," Hectii said. "And inside the gas chamber, the atoms in the wind/no-wind atomic-interface are… What are they doing? Show me the next picture, Chip."

"Does this view help?"

1C



"Interesting," Hectii said observantly. "The bullet and piston have come to a stop. That means the momentum has moved from the bullet, through the bullet/piston atomic interface, through the piston, through the piston/gas atomic interface, and into the atoms of gas that're now circulating in the gas chamber."

"Did the gas experience an impulse?"

"Obviously it did," Hectii expressed, as she keyed data into her interface-gloves. "First I need to know the speed and s-momentum of the bullet after it came to a stop. Does this look correct?"

Final s-Momentum Data, After Bullet Stopped		
	motion data	**s-momentum**
Exvo/human	$[0.2]10\ (kg)\frac{m}{s}$	**2** ρ
Solar view (+30 000 m/s)	$[0.2]30\ 000\ (kg)\frac{m}{s}$	**6 000** ρ
Galactic view (+200 000 m/s)	$[0.2]200\ 000\ (kg)\frac{m}{s}$	**40 000** ρ

"Excellent," Chip said. "Once again, you've highlighted the most important data in red."

"Now I subtract the initial s-momentum from the final s-momentum to find out how much exvo-atomic momentum the piston transferred to the atoms of gas," Hectii said.

"Remember," Chip said. "Impulse is a measure of the amount of momentum transferred from one object to another. Because impulse is an amount, there's really no such thing as a negative impulse."

"Thanks for the reminder," Hectii said appreciatively. "With that in mind, the calculations of impulse are:"

Impulse/Momentum-Transferred to Gas Atoms		
	final – initial	**ImΔρ** ***ms*-transferred**
Exvo/human	0 ρ – 2 ρ	**2 ρ**
Solar view	6 000 ρ – 6 002 ρ	**2 ρ**
Galactic view	40 000 ρ – 40 002 ρ	**2 ρ**

"Well done," Chip said. "From all three views, it's apparent that the bullet transferred 2.0 ρ of atomic s-momentum to the atoms of gas."

"That verifies the Space-sci Sherlock's galactic fact #1 of measurable impulse," Hectii said. "In part, galactic fact #1 reminds us, when an object changes speed, the calculation of its impulse [momentum transfer] should be measured with respect to the object's galactic or absolute speed. Fortunately, the values for human-level measurement of impulse are always identical to the values for galactic-level impulse."

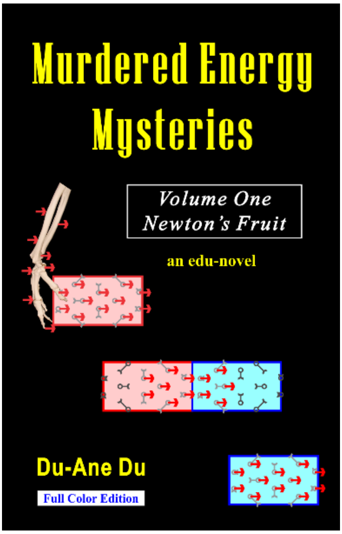
"Therefore, human-level measurements of impulse are a valid and highly accurate reflection of what's happening at the galactic level," Chip said. "ρ of impulse may be viewed as an absolute measurement."

"In this case, all three views show that the bullet transferred s-momentum to the atoms of gas," Hectii said. "When the s-momentum was in the bullet, it was semi-aligned exvo-atomic s-momentum. And as the momentum entered the gas, the piston helped the gas retain the semi-aligned nature. A wind will always exhibit semi-aligned exvo-atomic motion vectors, because the wind has semi-aligned forward motion.”

“But there’s also a wind/no-wind atomic interface, remember?” Chip said.

“Of course I remember,” Hectii said playfully. “The wind is circulating around inside the gas chamber. And as it circulates, the wind atoms will collide with the no-wind atoms. As the wind and no-wind atoms collide, some of the bullet’s momentum will transfer from the wind atoms to the no-wind atoms.”

Excerpted from:



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“Good, and what’ll that result in?”

“A gradual increase in the average forward speed of the atoms of gas in the gas chamber,” Hectii said. “You know, Chip, it’s as if we’re watching both aspects of the impulse fact #1 of dual atomic motions—at the same time.”

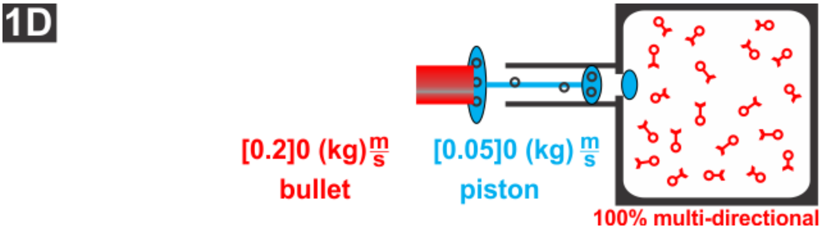
“Interesting observation.”

“You know, the impulse fact #1 of dual atomic motions tells us, applying an impulse [momentum transfer] to an object can either cause an increase/decrease in the invo-atomic total s-momentum—which relates to atomic speed and overall temperature—or the impulse can increase or decrease the object's exvo-atomic net v-momentum—which relates to human-level motion."

"In this case," Chip said, "the impulse caused a decrease in the bullet's exvo-atomic motion, and it simultaneously caused an increase in the gas atoms' invo-atomic motion."

"Exactly," Hectii said triumphantly, "human-level exvo-atomic motion became invo-atomic motion."

"22nd century scientists call this process, **distributive multi-directionalization** of the new momentum." Chip said. "Here's the final picture:"



"As the atoms of gas collided, the momentum was distributed throughout the atoms of gas," Hectii considered aloud. "That means the atoms are now moving faster, and the temperature has increased. Distributive multi-directionalization must be an inherent aspect of gas behavior."

“It’s a behavior of all fluids,” Chip said. “But was the increase in the invo-atomic average speed caused by the transfer of momentum, or by the transfer of energy (speed infused impulse)?”

“If the increase in invo-atomic speed was the result of a kinetic-energy transfer, then it should be identical to the amount of kinetic energy allegedly lost by the bullet,” Hectii hypothesized, as she deftly keyed data into her interface-gloves. “When the bullet came to a stop, the bullet’s final kinetic energy was:”

Final Kinetic Energy Data, After Bullet Stopped		
	motion data	**KE**
Exvo/human	$1/2[0.2]10^2$	**~10 $J_{[0.2]}$**
Solar view (+30 000 m/s)	$1/2[0.2]30\ 000^2$	**~90 000 000 $J_{[\mu]}$**
Galactic view (+200 000 m/s)	$1/2[0.2]200\ 000^2$	**~4 000 000 000 $J_{[\mu]}$**

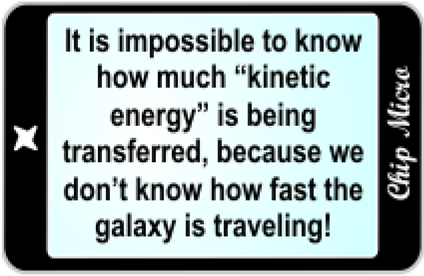
“Now,” Hectii said introspectively. “To find the amount of kinetic energy allegedly transferred through the piston and into the atoms of gas, I simply subtract the final minus the initial, like this:”

Kinetic Energy Transferred to Gas Atoms		
	final – initial	**KE transferred**
Exvo/human	0 – 10 J[0.1]	**10 J[0.2]**
Solar view	90 000 000 – 90 060 060 J[μ]	**~60 010 J[μ]**
Galactic view	4 000 000 000 – 4 000 400 010 J[μ]	**~400 010 J[μ]**

"Chip, what kind of test did you call this?"

"The Parallax/Simple-Relativity Test of Unit Reliability," Chip said.

"Interesting," Hectii said as she studied the answer column. "If multi-parabolic kinetic-joules[IC] of kinetic energy exist in nature, then the piston must've transferred at least ~400 010 J[μ] of kinetic energy from the bullet to the atoms of gas. And, the principle of distributive multi-directionalization states, as the gas atoms circulated in the chamber, they collided with one another until the ~400 010 J[μ] of new kinetic energy caused all of the atoms of gas to fly at a higher velocity."



"It may be worth noting," Chip said, "that the rise in the invo-atomic speed of the gas atoms will not only cause an increase in the temperature of the gas, it will also produce an increase in the gas pressure inside the chamber."

"Right," Hectii affirmed, as Pico's avatar came into view. "We learned all about temperature and pressure in chemistry last year. When the temperature rises, the pressure also rises."

"But why did the temperature rise?" Pico inquired as she walked into view.

"Distributive multi-directionalization of the impulse [momentum transfer]," Hectii said. She observed that Pico's avatar was chewing something, noted the smell of cinnamon, and concluded that Pico was chewing gum.

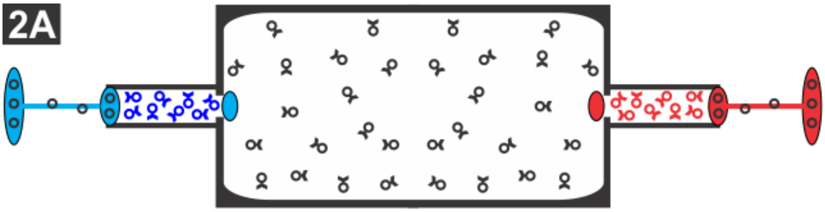
"Come again?" Pico said, as her brows narrowed quizzically. She offered Hectii an invisible stick of gum. "Distributive what? That term was a mouthful."

"Yes, but it's important," Hectii stressed, as she took the gum and began unwrapping it. "Let me show you. Chip, let's refill the pistons and launch another bullet."

"I want to launch one too," Pico requested. "Chip can you put another virtual piston on the other side of the virtual gas chamber?"

"How's this?" Chip said, as the following two-piston gas chamber apparatus appeared on their 3D visor displays:"

2A



100% multi-directional

"I like this picture," Pico said, as she placed a red bullet in the right launcher and aimed it at the right-red piston. "You can see that the gas atoms are moving in all directions. They have a multi-directional invo-atomic average speed, and that means they have a temperature."

"Chip," Hectii requested, "set the bullets so the mass is 0.7 kg, and both of us will set our launchers to 20 m/s."

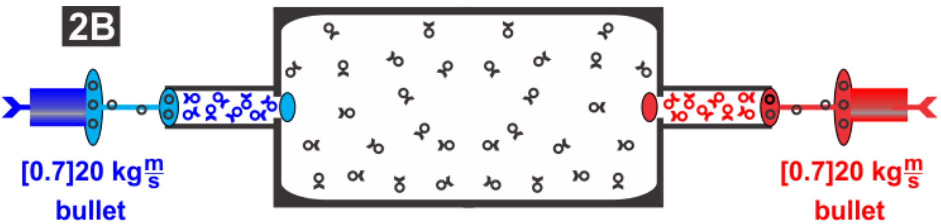
"Understood," Pico said, as she adjusted her launcher's control. "Let's launch our bullets at the same time. Ready? One, two—"

"—launch," the two girls said simultaneously as they both hit the launch buttons. The two bullets flew toward the pistons, the pistons compressed, the gasses blew into the gas chamber, the valves closed, and the wind-like gasses circulated throughout the chamber.

"One quick note," Chip said. "You two are interested in the direction of atomic motion. With that in mind, as I illustrate what's happening to the gas atoms, the vectors may not be drawn to scale, and the number of atoms shown is not necessarily proportional to the amount of gas in the chamber or in the pistons."

"That's fine, Chip," Pico replied agreeably. "We're simply looking for a basic understanding. Now show us what it looked like as the bullets began to strike the pistons."

Here:"



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CONCLUSION: More research needs to be done into the relationship between mechanical energy and other theoretical forms of energy. Many common beliefs may actually be philosophical myths.

Murdered Energy Mysteries seeks to increase understanding of the various forms of momentum and momentum transfer, as well as the various forms of energy and energy transfer. The lack of understanding on the part of the scientific community is substantial, and more research needs to be done.

—Du-Ane Du, author of the edu-novel *Murdered Energy Mysteries* (Amazon, Kindle, e-book 2018, paperback 2021.)

More information, see:
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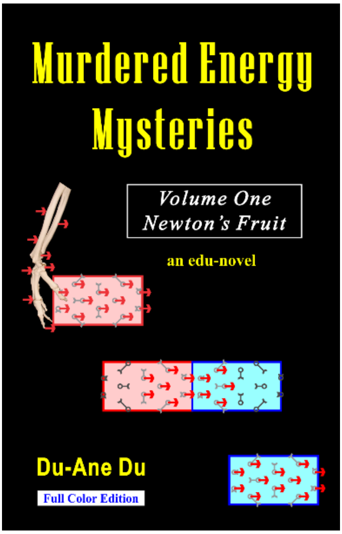

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