

Grantville Gazette-Volume XVIII

Table of Contents

[What is this? About the Grantville Gazette](#)

Written by Grantville Gazette Staff

FICTION:

[The Anaconda Project, Episode Seven - Delayed](#)

Written by Eric Flint

[Gifted with Pascal](#)

Written by Tim Roesch

[Quintessentially Blonde](#)

Written by Virginia DeMarce

[Too Late for Sunday](#)

Written by Michael Badillo

[Dark as a Dungeon](#)

Written by John Zeek

[The Bloody Baroness of Bornholm](#)

Written by Kerry Offord

[And That's How the Money Rolls In](#)

Written by Terry Howard

SERIALS:

[Butterflies in the Kremlin, Part Seven, The Bureaucrats are Revolting](#)

Written by Gorg Huff and Paula Goodlett

[Stretching Out,](#)

[Part Five: Riding the Tiger](#)

Written by Iver P. Cooper

[Sonata, Part Four](#)

Written by David Carrico

NONFICTION:

[What's For Dinner: Typical Dishes From 1632.](#)

Written by Anette Pedersen

[Standing on the Shoulders of Giants: Mathematics After the Ring of Fire](#)

Written by William Truderung

[Safety First: Industrial Safety in 1632.](#)

[Part Two, Technical Aspects](#)

Written by Iver P. Cooper

Grantville Gazette, Volume 18

Grantville Gazette, Volume 17, 1 July 2008

This is a work of fiction. All the characters and events portrayed in this magazine are fictional, and any resemblance to real people or incidents is purely coincidental.

Copyright © 2008 by Grantville Gazette

A 1632, Inc. Publication
Grantville Gazette
P. O. Box 7488
Moore, OK 73153-1488

Credits, *Grantville Gazette* , Volume 18, 1 July 2008

Gifted with Pascal © 2008 by Tim Roesch

Quintessentially Blonde © 2008 by Virginia DeMarce

Too Late for Sunday © 2008 by Wade M. Rich

Dark as a Dungeon © 2008 by John Zeek

The Bloody Baroness of Bornholm © 2008 by Kerryn Offord

And That's How the Money Rolls In © 2008 by Terry Howard

Butterflies in the Kremlin, Part Seven, The Bureaucrats are Revolting © 2008 by Gorg Huff and Paula Goodlett

Stretching Out, Part Five: Riding the Tiger © 2008 by Iver P. Cooper
Sonata, Part Four © 2008 by David Carrico

What's For Dinner: Typical Dishes from 1632 © 2008 by Anette Pedersen

Standing on the Shoulders of Giants: Mathematics After the Ring of Fire © 2008 by William Truderung

Safety First: Industrial Safety in 1632, part Two, Technical Aspects © 2008 by Iver P. Cooper

What is this? About the Grantville Gazette

Written by Grantville Gazette Staff

The *Grantville Gazette* originated as a by-product of the ongoing and very active discussions which

take place concerning the 1632 universe Eric Flint created in the novels *1632*, *1633* and *1634: The Galileo Affair* (the latter two books co-authored by David Weber and Andrew Dennis, respectively). This discussion is centered in three of the conferences in Baen's Bar, the discussion area of Baen Books' web site. The conferences are entitled "1632 Slush," "1632 Slush Comments" and "1632 Tech Manual." They have been in operation for almost seven years now, during which time nearly two hundred thousand posts have been made by hundreds of participants.

Soon enough, the discussion began generating so-called "fanfic," stories written in the setting by fans of the series. A number of those were good enough to be published professionally. And, indeed, a number of them were—as part of the anthology *Ring of Fire*, which was published by Baen Books in January, 2004. (*Ring of Fire* also includes stories written by established authors such as Eric Flint himself, as well as David Weber, Mercedes Lackey, Dave Freer, K.D. Wentworth and S.L. Viehl.)

The decision to publish the *Ring of Fire* anthology triggered the writing of still more fanfic, even after submissions to the anthology were closed. *Ring of Fire* has been selling quite well since it came out, and a second anthology similar to it is scheduled to be published late in 2007. It will also contain stories written by new writers, as well as professionals. But, in the meantime . . . the fanfic kept getting written, and people kept nudging Eric—well, pestering Eric—to give them feedback on their stories.

Hence . . . the *Grantville Gazette*. Once he realized how many stories were being written—a number of them of publishable quality—he raised with Jim Baen the idea of producing an online magazine which would pay for fiction and nonfiction articles set in the 1632 universe and would be sold through Baen Books' Webscriptions service. Jim was willing to try it, to see what happened.

As it turned out, the first issue of the electronic magazine sold well enough to make continuing the magazine a financially self-sustaining operation. Since then, nine more volumes have been electronically published through the Baen Webscriptions site. As well, *Grantville Gazette*, *Volume One* was published in paperback in November of 2004. That has since been followed by hardcover editions of *Grantville Gazette*, Volumes Two and Three.

Then, two big steps:

First: The magazine had been paying semi-pro rates for the electronic edition, increasing to pro rates upon transition to paper, but one of Eric's goals had long been to increase payments to the authors. *Grantville Gazette*, Volume Eleven is the first volume to pay the authors professional rates.

Second: This on-line version you're reading. The site here at <http://www.grantvillegazette.com> is the electronic version of an ARC, an advance readers copy where you can read the issues as we assemble them. There are stories posted here which won't be coming out in the magazine for more than a year.

How will it work out? Will we be able to continue at this rate? Well, we don't know. That's up to the readers. But we'll be here, continuing the saga, the soap opera, the drama and the comedy just as long as people are willing to read them.

— The *Grantville Gazette* Staff

FICTION:

The Anaconda Project, Episode Seven - Delayed

Written by Eric Flint

Gifted with Pascal

Written by Tim Roesch



Mary Timm hated church steeples.

There was no glass in them. They blocked the light in odd ways, cast shadows where shadows had no place being. They stabbed the sky and mocked the sun. They interfered with her art.

Having a boy hanging from one didn't help either.

"Boys!" Mary snarled as she marched into the fire department.

Mary couldn't help but pause a moment when she walked inside. Now here was a place that was worth coming to. There were bright colors and shiny pieces of metal and reflections and windows. She would very much like to linger on this late fall morning but she knew she couldn't. Whatever Blaise was screaming from up there, hanging from the steeple, it would have been cruel to leave him.

"Shouldn't you be in school, Mary?" one of the firefighters asked. Though Mary was only eleven, she had a look of frustration and forbearance of one much older.

"There is a boy hanging from the church tower."

The five men standing in the large garage stopped and looked at her.

"What?" one asked in English.

"There is a stupid boy hanging from . . ."

She jumped when the alarm went off.

"Just got a call!" Another man ran into the garage. "Some crazy kid is hanging from the steeple at the Catholic church!"

"That's what I was trying to tell you!" Mary yelled.

The small garage erupted into activity and Mary fled to a corner to stay out of the way. With an explosion of noise and activity the fire trucks raced out of the garage.

In the quiet after the last truck drove off Mary glanced up at the windows high on the walls then at the nice, neat squares of light on the clean floor of the garage.

"What a waste of light." she muttered to herself. With a sigh she turned and walked back to the church with the crazy boy hanging from that stupid, light-blocking steeple. If God truly loved her, He would have Blaise Pascal knock the steeple down so that at 9:30 in the morning the light would hit the window of that nice building a block over and . . .

* * *

Julie Drahuta hated mornings.

Mornings should be calm, pleasant times. If she had her way, the day would begin slowly, comfortably. There would be time to sip some coffee, read a newspaper, have a nice quiet breakfast.

"But no! I have to be here asking myself why a smart boy like you was hanging from a church steeple! Jesus God! What were you thinking?" Julie tried to calm herself. She glanced up at the steeple then back at the tear-stained, rope-burned, bruised, angry boy before her. In her admittedly grumpy opinion, he was being tended to much more carefully than he deserved.



"It did not work! It did not work!" Blaise waved a plastic ruler at her. Then he threw it on the ground and stamped on it.

"Hey! Stop that!"

"It didn't work!" Blaise shouted. Julie pulled him away from the object of his tantrum. The rest of his comments were muffled and in French; a very foul French one might not expect to hear coming from the

mouth of an eleven year old. She wrapped him up in a hug.

To a casual observer it might appear that Julie was trying to suffocate the boy.

"Should I call a child protection officer?" a firefighter asked as Blaise screamed, muffled by Julie's hold on him.

Julie turned with a slow, reptilian grace that wiped the smile from the firefighter's face.

"That will be all, Gus," Julie chirped with her best brutal, violence-promising smile.

"You know . . ." Chief Matheny scratched his head then replaced his helmet as he looked up at the steeple then around the base. "I've seen kids do the oddest things and get themselves into situations the experts can't write about in textbooks because no one would believe the book. Gus, look around for any loose equipment."

"I'm sorry you had to go to all of this trouble, Chief Matheny." Julie sighed as Blaise Pascal, the world's greatest mathematician, sobbed and cursed in her arms.

"This beats all. Wiley Coyote couldn't have done better with two credit cards and a direct number to ACME. What's worse, the darn thing almost worked. The crossbow worked, the block and tackle worked, even the attempt to counterbalance his weight with that bag of rocks worked. The harness slipping up around his neck was a mistake anyone could have made. That definitely didn't work."

Julie looked at the bruises on Blaise's neck. They looked similar to the sorts of marks a victim of strangulation might have.

"He's a handful." She tried to smile.

There was a flurry of cursing; some of it in a broken English that made the curse words sound less vulgar and more humorous. Blaise tried to stamp on the plastic ruler again.

"Blaise! Enough!"

"Of course, getting up is a lot different than getting back down. Cats sometimes have that problem and they're excellent climbers." Chief Matheny shook his head.

"What has the imp of Satan done now?" a distant female voice screeched in French.

That had been one of the first complete French sentences Julie Drahuta had learned. Considering the relationship between Blaise and his governess, she could understand why.

Watching Madame Delfault approach one might think Blaise was going to be the very much "former" greatest mathematician in the world.

Julie wasn't concerned. No one would argue that Madame Delfault always sounded one moment away from going psycho on the boy. She treated Blaise with the sort of loving care one might have expected from his mother, who Julie knew from history books had died before Grantville had appeared.

"I thought Bill was joking about some boy wanting to hook an indoor extension cord to the mains out at the power plant. I don't see it as funny now. He's going to kill himself by the numbers if someone don't

make it clear to him that life's too short to die by accident. You figure out what he was doing, Julie?" Chief Matheny glanced quickly at the approaching governess.

"I was called away from a late breakfast to find him being lowered to the ground by your very professional fire department." Julie sighed. She pushed Blaise away from her in such a way that he would be able to see his governess approach.

Julie Drahuta might know that Madame Delfault loved the boy but Blaise wasn't sure about that, apparently. If Blaise was an imp of Satan then in his eyes Madame Delfault was the wrath of God approaching. Julie smiled. For a smart kid, he was easily fooled.

"Tell me what you were doing or I give you to her" Julie said slowly.

"It was the fault of that!" Blaise pointed with his chin. He was too smart to take his eyes off his approaching doom.

"What were you doing?" Julie snapped.

Blaise pulled a piece of notebook paper out of his pocket then hunched his shoulders to more fully hide behind her. He handed the paper, as bruised and battered as he was, to Julie.

There were triangles and numbers and erasures and even a stab mark.

"What is this?"

"She is coming!" Blaise whispered. "Do something!"

"You were trying to measure the height of the steeple with that piece of junk?" Chief Matheny laughed, pointing to the cheap plastic ruler.

Blaise tried to stomp on the ruler again. With the foot that was missing a shoe.

"Young man" Chief Matheny shook his head. "Next time come by the fire house. I'll get you the proper tools to do a similar triangle calculation. Hell, to avoid this mess, I'll get you the building blueprints. And this harness? You raise yourself up anything taller than a kitchen table with something like this again and I'll strangle you myself. And I'm taking that crossbow too. You make it yourself?"

Blaise nodded silently.

"Blaise Pascal! What have you done?" Madame Delfault had finally gotten past the crowd and rushed up to inspect her charge.

"And I think I am going to inspect your 'laboratory,' Blaise." Julie looked at the crossbow and shuddered. Somehow she knew beyond a shadow of doubt that the markings on it were not for show. It was, for all intents and purposes, a sniper crossbow, if she was reading the markings on it correctly. It explained how the rope had gotten through the open cupola that supported the cross at the top of the steeple.

Blaise tried to hide from both Madame Delfault and the chief of Grantville's fire department.

A sudden thought made Julie ask, "Did you see a little girl around here?"

"Mary's in the church. She's looking at the stained glass windows. She likes windows. That she does. She paints pretty pictures on glass. I hope she learned her lesson about glass and how sharp it is when it breaks." Chief Matheny shook his head. "Regular 'Our Gang' you got going, Julie. Try to keep 'em alive, would you?"

"That's my job, Chief," Julie could smile too.

* * *

Allan Sebastian hated education.

Teaching would have been his dream job if it wasn't for all this 'education' stuff.

He remembered his first classroom, the smell of it and how it felt to write his name on the chalkboard. He remembered his first stack of papers to be graded and the first report cards he had signed.

He had assumed after the Ring of Fire struck that there would be no place for some middle school math teacher. He had figured that he would have to struggle to remain teaching.

That last part was true. With all the offers and opportunities for someone who knew numbers it was a miracle he hadn't been kidnapped and taken by force to some royal court. Certainly the titles "Royal Accountant" or "Royal Engineer" had a certain ring to them, and he'd already been offered both positions. The loud bevy of relatives who had come through the Ring of Fire with him, including his eldest daughter, reminded him every day of all the opportunities there were available for a man with his experience.

Why couldn't he just be left alone to teach?

Then his youngest daughter had introduced him to Blaise Pascal. That had been only a few months ago.

August? It seemed like decades ago.

"I don't need to see the damn book, Allan!" Archie Clinter slapped his hand down on his desk. Allan had known the principal of Fluharty Middle School long enough to know it wasn't a sign of anger but of frustration. Archie didn't deal with frustration very well. Oddly enough, considering his job, he didn't have to.

Allan slid the encyclopedia closer to Archie; taunting him with it. There was a picture on the page of a much older Blaise. He was probably thirty in the picture and dead almost four hundred years. That same Blaise was eleven now and outside Archie's office waiting for doom to descend on him.

How the world had changed.

"I understand, Allan! I get it. Blaise Pascal; world's greatest mathematician. Do you understand me? You will note that he died at a ripe old age in this here book! But he almost died at eleven hanging from a church steeple! What the hell was he doing up there and not in class? What the hell happened? And why are you here and not Owen? Blaise is his responsibility. He's the Gifted and Talented Education teacher . . . more or less. We agreed with you, Allan. Blaise is gifted. Okay, I admit that. We admit that."

"Yes. Where is Mr. Maddox?"

"Look, he has his hands full with the normal special ed kids."

"Normal special ed?"

"You're confusing the point! You are not special ed qualified. If we were . . .if this was . . ."

"Blaise would be four hundred years dead and Owen Maddox would still need a special ed teacher for himself." Special ed qualified or not, Allan knew he was a better teacher than Owen Maddox, at least when it came to kids like Blaise and his sister.

"And he would have you before the school board!"

"Lucky for Blaise the school board has less time to play petty politics. It actually has to perform now, not sit around and bicker about things it knows nothing about, like education."

"That is not fair."

"David Weller."

If Allan had slapped Archie across the face it might have had a lesser effect on the man.

"Look, you want him, fine. Maybe you can keep him out of everyone's hair. Okay? Case closed. It's probably moot. Julie wants a piece of him. Steve is annoyed with the boy. That toy he had, that crossbow, put a steel tipped bolt . . ."

"He made it."

"That's the point. He should be in school, not making crossbows. Gifted child or not, he has to be like everyone else."

"Do you listen to yourself?" Allan asked quietly. "I mean, really listen. Blaise isn't a theoretical 'gifted' child. The mentally-challenged need someone who knows mental challenges. Leave them with Owen. He likes them and does a fair job with them. He is so far out of his depth with Blaise or kids like him that it is almost funny. I want Mary and Jacqueline too."

"You are not . . ."

"We are not in West Virginia anymore."

"That is no excuse for . . ."

Allan placed a piece of crumpled and bruised paper over the picture in the book.

"What's this? Your resignation? His suicide note?"

"The boy you want to be like everyone else was trying to demonstrate the theorem of similar triangles. He wasn't pulling a prank. He was trying to apply a mathematical theorem with a crossbow and a cheap ruler. Looks like he might be more than one kind of genius."

Archie took in a deep breath and closed his eyes. "Allan, how can you do that dead? I can have Blaise put in your class. I don't know about Jacqueline and Mary. They are elementary school kids."

"You can't keep someone like him in a regular classroom. You'll kill him in a regular classroom. Jacqueline might kill in a regular classroom. She hates the Fluffy Bunny reading series. I don't blame her."

"Second graders love the Fluffy Bunny reading series."

"You are missing the point! Jacqueline, like her brother, is gifted. Have you seen some of the stuff she's written?"

"I've heard some of it. Her reading teacher gives me a synopsis. I don't know whether to laugh or cry. Some of the words she uses . . . I thought we were talking about Blaise."

"We were talking about me taking Blaise, his sister and Mary."

"I can probably give you Blaise . . ."

"All of them."

"Allan . . . he is a child. Okay . . . a smart child . . ."

"We failed, Archie. In the year 2000, we failed. We failed kids like him. We were looking to save a few bucks and free up some class space so we ignored or didn't fund the gifted programs. Nobody felt sorry for 'gifted' kids. Who the hell did they think they were anyway? Acting so smart. Suck it up and deal, smart ass! Stop being so smart and be like everyone else!"

"Allan . . ."

"That boy out there wasn't scared that he almost died. He wasn't vandalizing the church or pulling a prank. He was applying math. It didn't work so he was going to show that stupid, cheap ruler . . . If he had the metal one I gave him this wouldn't have happened."

"He was making a catapult with that ruler. Owen was right to have taken it from him. Imagine the chaos if every kid made a catapult in class . . ."

". . . a trebuchet . . ." Allan added.

"Whatever! I don't care if he was making a nuclear reactor! He was . . ."

"Blaise, the boy who is sitting outside your office right now, the same boy who is in this encyclopedia, was deriving equations to relate load arm length to trajectory. I have the math he was doing in my classroom."

"He was misusing school property! Like the time he took apart the computer in class . . ."

"Okay, fine, he was 'misusing' an expensive metal machinist's ruler which, by the way, I gave him. He's taught himself algebra and now he's working on calculus, Archie. He wasn't doing it because he wanted to get into college or because Dad wouldn't let him have the car if he didn't score above 1200 on the SAT. Learning and creating are what he does. You put him in a regular classroom then you're right, Archie, he should have broken his neck up there. He would be better off than he is in that classroom."

"Allan, you're being melodramatic . . ."

"You remember another kid who wasn't so lucky?"

"Allan," Archie looked up at Allan with pleading eyes, "Don't. Don't even. . . "

"We failed them. We failed him. He killed himself because someone thought it was better to put him with kids his own age and pretend he wasn't writing symphonies. Are we going to do that with Blaise, Mary and Jacqueline? We know what Blaise is capable of. And his sister, what about her? She's writing books and she's eight."

"Allan . . ."

"We don't need school board meetings and committees. We don't need to convince a mother that her boy is just like everyone else. We don't need to lie to anyone. The Ring of Fire gave us a brand new start."

"We didn't lie, Allan. It was decided that . . . it would have been better for him . . . Allan . . . David Weller was different. He . . . he . . ."

"Maybe we could have lied about David Weller and pretended it was a fluke and now that he's dead who's to say what he was or wasn't? He didn't get his name in an encyclopedia. He didn't have a chance. We didn't give him a chance. Owen didn't think the boy was gifted, then blamed his 'gift' for the suicide."

"Enough!"

The death of David Weller was a sore issue with Archie. Allan knew that. David Weller's grave came through the Ring of Fire. His parents and family didn't.

"When will we admit to knowing we were wrong?"

"Allan," Archie sighed, "you are not being fair."

"Fair?" Allan whispered back like a judgment of guilt.

No one likes to find a child dead. Finding a child dead by his own hand was far worse.

"We were trying to make the best out of . . ." Archie closed his eyes again. "We did our best, Allan."

"I don't blame you. They dumped him in your lap because the school board was too afraid to deal with it themselves. They asked me to put together a few math sheets for him. Keep him busy, I was told. Keep him busy and quiet."

"Allan . . ."

"No one likes the gifted. We had the Special Olympics and everyone clapped as the 'special' people staggered across the finish line or threw a ball. A ten year old writes symphonies and we hush him up and tell him to be like everyone else. Not again, Archie. Never. I won't hush him up. There is a genius waiting outside your office right now. Let's do better this time."

Allan stood and left.

Archie stared down at the book. The picture was covered by the piece of notebook paper but the name

was not.

BLAISE PASCAL (1623-1662)



Archie looked down at the end of the entry.

Whether we look at his pure mathematical or at his physical researches we receive the same impression of Pascal; we see the strongest marks of a great original genius creating new ideas, and seizing upon, mastering, and pursuing farther everything that was fresh and unfamiliar in his time. We can still point to much in exact science that is absolutely his; and we can indicate infinitely more which is due to his inspiration.

With something that could be tears in his eyes he looked up at the walls of his office.

He remembered when he had first accepted the position as principal. He had held it in his mind like he had held his first child.

He remembered how his shoulders had gone back and the smile that refused to leave his face. He remembered how proud he had been.

Now, looking at the pieces of paper on the walls of his office from places that probably wouldn't exist, ever, he remembered the opposite moment.

He remembered finding a boy hanging from a pipe in the boy's washroom on the second floor.

The tears in his eyes were real now.

* * *

Julie hated being right.

Of course, she loved it too. Her greatest successes had come from being right when everyone else had been wrong.

"Tell me I didn't waste your time." Julie sighed, the crossbow dangling from her hand.

Chief Matheny looked around the room. Stepping into it was beyond possibility without a wrecking bar and explosives. Someone, a very young and dangerous someone, had carefully planned this room to hold everything it contained and still allow a small body to worm its way in and breathe.

"Swing a cat, hell," Chief Matheny whispered. "There's not enough room in here to think about swinging something." His eyes danced around the room.

"Some of this stuff looked . . . dangerous. I called you right away."

"How was this allowed?" Chief Matheny asked quietly. "How did he get those manuals on electrical contracting and how . . . how does an eleven year old boy read them then . . . are those the electrical blueprints he's got there? Damn. And how was it that he didn't electrocute himself when he did that?" Chief Matheny looked at the wall.

"Chief?" a firefighter asked from just over his shoulder.

". . . This is what we are going to do. First, I want the power shut off to this entire building while I try to figure out what that boy was trying to do to that junction box and outlet. Then, I want everything in this room dismantled and removed from this room. This is a hotel, not a research lab. People live here and they could have died here, Julie. That's a container of hydrochloric acid. Either someone has a pool somewhere with a missing container of pool acid or young Blaise found a meth-lab. I don't think there are pools big enough . . . if he got his hands on pool acid, what has he got in those bottles . . . ?"

"Where do you want us to put everything, Chief?" a firefighter asked.

"In the shed behind the firehouse." Chief Matheny turned and fixed Julie with a stare that made her back up a step. "That boy is going to need to be as close to emergency response as I can get him. Your job, Officer Drahta, is to protect children from the predations of adults, correct?"

Julie nodded.

"Keep the boy away from me until I control my temper. Then I suggest you find someone to protect the town of Grantville from the predations of this boy. I have a book with some color pictures in it back at the firehouse he needs to see and I agree with Bill. Keep his little ass away from the power station until someone teaches him that you do *not* do *that* to a junction box in a structure with people *sleeping in it*!"

The silence was profound.

No one had ever heard Chief Matheny shout. They did know that Chief Steven Matheny hated fires. Even small, well-tended ones.

* * *

Blaise hated that ruler.

He hated it with an intensity that Satan must save for mankind.

Tears dripped in fearful, trembling streams from angry eyes.

The ruler had been off by at least a thirty-second of one of those God cursed things called inches. The metric system, invented by the French of course, was better. The metric system wouldn't have failed him.

The angle was measured perfectly. His calculations were flawless.

It should have worked! He had been wrong. Wrong!

Because of that damn ruler . . .

Blaise shook himself. Or, rather, someone else did.

"Snap out of it!" Mr. Sebastian shook him. "We'll go to my room. I think you've been punished enough just by sitting here all this time."

"At least a thirty-second of an inch." Blaise glared up at Allan Sebastian with tears in his eyes. "I hate that ruler! I had to prove it was wrong, not me!"

Allan Sebastian leaned in close. So close his nose almost touched Blaise's.

"No mathematical equation is worth dying for," he whispered harshly. "Do you understand?"

"Yes, Mr. Sebastian." The world's greatest mathematician nodded.

"Your punishment is . . . I want ten rulers to replace the plastic one you broke. They will be accurate to at least a thirty-second of an inch . . . no! One sixty-fourth of an inch. Ten, Blaise. I want ten. You will make them. I want them all by the end of the week. Understand? Whatever else you have to do, whatever other punishments, that one is mine. You want my help? I need yours."

"Yes." Blaise nodded and stood up. He didn't expect the slap. It came, at least to him, from out of absolutely nowhere.

"You fool!" Jacqueline would have hit him again had Allan not grabbed her arm and spun the girl about and wrapped her in his arms. "Let me go! I will kill him! He is my brother! I have the right to kill him! What would Father say?"

"Hold her!" Blaise begged Mr. Sebastian. His sister had hit him with her prized notebook. Blaise knew, though didn't fully appreciate, that his sister saw writing in much the same way he saw mathematical equations.

For his sister to hit him with her notebook meant she was very angry, possibly worse.

"Fool!" Jacqueline screamed, tears in her eyes.

* * *

Jacqueline loved her brother.

She had waited and watched all day as Blaise was berated and shouted at. One thing she knew without any uncertainty. The adults hadn't been merely angry. They had been scared too. Her brother had almost died.

She loved him even if some fool book declared him the world's greatest mathematician, which had caused something of a panic in their father's circle. Because of that stupid book they had been sent fleeing from Paris.

She loved her brother enough to want to kill him because she would have very much hated to see him dead.

* * *

Archie hated making this kind of decision.

He looked at the eleven rulers on his desk.

"That one was the most difficult." Blaise pointed at the last ruler he laid on Archie's desk.

Allan laughed. It was a short, quick laugh.

"This one," Blaise pointed at the first ruler he had put down, "is the best, I think. If there are to be twelve of these inches in a foot then one should use the base twelve system to number the units. I could do one in base two . . ."

Allan raised his hand. Blaise subsided but only barely.

"Okay, this is what we'll do," Archie began firmly; his words humming with official tones. "After Christmas break I'll make you the gifted . . . the GATE teacher. Owen won't like it, but tough. Okay? I said it. Don't say a thing, Allan. I don't want that boy's name mentioned again. I don't have the time to remember what for all intents and purposes never was."

"You are talking of me?" Blaise asked.

"No," Jacqueline snapped. "not everything is about you. He means David Weller."

"I'll put Jacqueline in your class with Mary Timm. Just don't . . ."

"How did you learn about him, Jackie?" Allan asked.

Jacqueline wasn't sure if she liked being called Jackie. It made her name sound all American.

"Logan showed me his grave. She told me about them. She told me all about him. He would make a good story."

"No!" Archie spun about. His eyes were looking for a taller person, presumably older, to shout at. He almost didn't look down at Jacqueline. "I mean, I would rather . . . you did not. Besides, to do the story right you would need to talk to the person who found him. I know he won't speak to you. Hear me?"

Archie turned back to Allan. "You win, okay? What else do you want? Huh? You're the GATE teacher now. You won. Two eighth grade math classes in the morning then you get them. All of them. Okay? All I ask is that we forget the past. Finally. Can we do that? Can we . . ."

Archie turned to go then stopped. He looked about frantically.

"Mary? Where's Mary?"

"Upstairs." Jacqueline whispered, "She is in the boy's room. She is looking for ghosts on the glass."

Archie stared at the door leading out of Allan's classroom.

"I'll go get her, Archie."

"No," Archie said softly. "I will."

With that he turned and faced Jacqueline with a look he might have hoped looked stern and forbidding. Jacqueline saw something else.

"I normally don't talk to eight-year-olds like this, but I will now. Do not write about David Weller. Do not write his story. If you do I will expel you and you will have to buy all that paper you use."

Jacqueline clutched her notebook closer to her.

"Can I write a story about the death of Fluffy Bunny? I can write a book . . ."

Archie raised his hand. "Deal."

He shook her hand and left in search of Mary Timm.

The upstairs boy's room had large windows.

* * *

Jacqueline loved human emotions.

She collected them like a painter collects pigments, as a warrior collects scars and stories.

Now, for the first time, young Jackie wasn't so certain of her love of those things.

She had, in her short life, never seen desolation before. She wasn't sure if she could write David Weller's story now that she saw what it might mean.

"Are you okay, Jackie?"

Jacqueline plummeted into Allan's arms.

"Jackie?" he asked.

"Promise me." She prayed the prayer of all artists, punctuated by tears. "Promise me that when I die you won't try to forget about me."

"I won't. I promise."

Quintessentially Blonde

Written by Virginia DeMarce



Grantville, January 1635

"Why are you asking, Missy?" Debbie Jenkins asked.

"You know Pam Hardesty. In the going-to-be-a-librarian-someday classes with me. She's thinking about when she comes to get married. If she does. And what she's going to tell a respectable down-time man about that blank spot on her birth certificate. If she should marry one. A respectable down-time man, that is. Not that he's asked her, yet. If there was one on the horizon. So I thought, maybe . . . Well, everyone knows what Velma Hardesty was like, so maybe nobody knows. But I thought that maybe you and Dad had picked up some gossip back then. About who her father was, I mean. Or might have been."

"If even Velma knew." Debbie could be a little catty at times.

"Someone else had that tow-blond hair like Pam's," Chad Jenkins said.

Debbie raised her eyebrows.

"Cory Joe has it. Her brother," Missy pointed out.

"He's obviously not her father," Debbie said. "Cory Joe was only two when Pam was born."

"Besides Cory Joe," Chad said. "George Trimble."

"You're right." Debbi nodded. "George Trimble and all three of his sons, before they went prematurely gray. And George's mother. Mary Margaret Lang, she was. She just died last year."

Chad folded his newspaper and put it down. "Betty Mae Trimble's boys had it too—the Lunds, George's nephews. It ran all through those Langs. Harry and Tom Lund both had to get married. Either one of them would have been perfectly capable of it."

Debbie nodded her head. "I'd put my money on Rodney Trimble, though. If I were a betting woman."

"You know what?" Missy said.

"What?"

"They've *all* gone prematurely gray. Every single one of them. More like prematurely white. Pam is *not* going to be pleased at the thought that she's likely to have snow white hair by the time she's forty."

February 1635

Pam Hardesty climbed the steps to the assisted living center. She hadn't wanted to come, really. But after Missy told her what she had gotten from her parents, she couldn't seem to let it go. Mr. Trimble might be the easiest one to talk to. He hadn't married for, oh, years and years after she was born, and his wife was from California. She might not be so uptight about past history as Harry Lund's widow was likely to be.

If she didn't learn anything from Rodney Trimble, maybe she would screw up her courage and talk to Tom Lund next. His first wife had died in 1632 and his new wife was German. Past history for her, too. Harry Lund was dead. No way did she intend to tackle his widow Cheryl about it. Ever. She'd been in the same high school class as Jonathan Lund, Harry's son. His mom was a holy terror.

The only thing was that Rodney Trimble had been in the army. He might not have been around at the right time, no matter what Missy's mom thought.

But he might know something, even so. All the people who had this kind of hair were his cousins on the Lang side. And even if he got mad at her for coming, he was crippled up real bad, everyone said. So bad that he had to be in the center. His wife couldn't take care of him at home, any more. He wasn't going to hurt her.

* * *

But it wasn't that hard.

It was sort of like looking into a mirror, except that his hair was snow white.

When she said her name, he just looked at her for a while. Then he said, "Well, I guess Velma got it wrong when she decided to collect child support off the books from the lawyer who handled her divorce from Joe Lang."

Then he said, "I'm sorry I said that about your mother."

She answered, "I know Velma pretty well. I've been her daughter all my life."

"I'm not sure you know her all the way. We lived next door to each other. Ben was busy in the mines. Gloria Kay had to go to summer school every year to keep her teaching certification up because she only had a two-year degree. Velma was pretty much on her own. They counted on Irene to keep an eye on her, but she was six years older and had other things on her mind. We were fourteen when we did it the first time. We went steady all through high school. She thought that Gloria's 'keep your legs crossed' chat was a real scream, considering that it came two years to late. By then, we were doing it as often as most married people. Her folks were glad that I went into the army when I graduated. Looking back, they probably shouldn't have been. She missed it and started dating Joe Lang, Cory Joe's father. That marriage was okay for her while I was gone, I guess, but we started up again every time I came back on leave."

He looked a little uncomfortable at that. "I mean, that was what we did with each other."

This lay between them for a minute or two.

"When Joe found out, he got real mad, yelling that she was cheating on him. Velma pointed out that he wasn't missing anything—it wasn't as if she wasn't doing it with him, too, whenever he wanted it. Joe didn't see it that way and divorced her. Velma—well you should know the way she sees things, I guess. She thought that he was being just terribly unreasonable about it all."

Pam nodded. That was exactly what her mother would think in a situation like that.

"He wanted to take Cory Joe, but Velma realized that she could get back at him by keeping custody, so she did. Judges always favored the mother, her lawyer told her. He was from over in Fairmont. She didn't have any money. She couldn't pay his bill, so he wrote it off for nooky. Could have been disbarred, if he'd been caught playing those games."

Rodney Trimble looked at the girl. She was as white as a sheet. He'd never actually seen that happen, before. But she was so pale-complected to start with.

"Maybe she really did think it was the lawyer, the second time. She'd never gotten caught when she was doing it just with me, all those years through high school, but she got pregnant with Cory Joe real soon after she married Joe Lang."

Pam looked at him. "Thank you."

* * *

Rodney watched her leave, walking down the corridor from the sun room where they had been talking to the street exit. He hoped she was feeling a little better. He'd invited her to come back again if she felt like it. She seemed like a nice kid.

That's why he hadn't mentioned the other obvious possibility. People being people and Velma being the kind of girl she was. The one that had never seemed to occur to anyone but him. He'd adopted Laura Beth's two kids and given them his name before they came back from LA. They hadn't had any more of their own.

Joe Lang? He'd been awfully mad at Velma, but that probably hadn't stopped him from wanting her. And he'd been at her place twice a week, to pick up the boy for visitation and to bring him back.

If it had been Joe, who had been such a good father to Cory Joe and apparently had never given the girl a glance, well, that could really have hurt her feelings.

Himself, he sure wouldn't mind claiming a daughter like that one, if some down-time nutcase refused to marry her unless she had an official father.

He was a crock, of no use any more except to go to the sheltered workshop a couple times a week and sew pieces of leather together to make soccer balls. Dead beat for a full day after that little bit of work.

Laura Beth wasn't the kind to take umbrage about something he'd supposedly done a dozen years before they ever met. Just think how, stuck here in a town thousands of miles from her own home, his military disability payments gone with the wind in the Ring of Fire, two kids to support, she'd taken hold, gotten a job right away, then a really good apprenticeship learning to be an elevator mechanic. Not that there were many elevators in Grantville, but once old Howell Tillman died, she'd be the only person in the USE who really understood how elevators worked. In a few more years, Howell had told her, the country would be wanting a lot of elevators and people would be beating a path to her door.

Laura Beth was a great gal.

He wasn't going to last much longer. Maybe he could do this little Pam a favor before he went. It wouldn't be that far off the mark. He and Joe were some kind of cousins, after all.

Late March 1635

Pam sent Jean-Louis LaChapelle back to Haarlem with some forms that he was to get Velma to sign. Rodney Trimble wanted his name put on her birth certificate. Jean-Louis would have to get Velma to agree to that. Jenny Maddox had supplied a whole batch of forms for Velma to fill out.

He was also to get Velma to sign a notarized statement that both she and Rodney had been unmarried, neither of them married to anyone else, when Pam was conceived and when she was born. That seemed to be important to down-timers. In the year 1635, it seemed, if you had to be a bastard at all, it was a lot better to be a plain bastard than to be an adulterine bastard. Calvinists weren't any more modern about it than Catholics were.

Apparently Velma had forgotten to mention that one of her daughters was illegitimate when she married Laurent. Jean-Louis thought that they had better not mention it to his uncle.

Haarlem, Netherlands

The second run of lava lamps that emerged from the laboratories of the University of Leiden commanded prices equally extortionate with the first. At that point, Jean-Louis, with the receipts in hand, approached his uncle's wife in regard to the forms he had brought to Grantville.



Velma could scarcely believe that he was willing to transfer half of his shares in the project to her simply for signing some forms from Jenny Maddox.

As for Rodney? Why did he want to put his name on Pammie's birth certificate? He wasn't going to get anything out of it. It wouldn't have occurred to her at the time. By then, she had assumed that he was shooting blanks, not that he hadn't been good at it. Good old Rodney hit the target right on the button,

most of the time.

Damned old goat of a lawyer, dying when Pammie was just two, after he'd promised child support if she didn't make it public. Well, maybe that had been better. Lots of little kids were real blonde, but not many of them kept that hair when they got older. He'd been her divorce lawyer, after all. He'd seen Joe lots of times. What the hell? She'd sign the papers. Joe was somewhere up-time and he sure would never have claimed Pammie.

Not that she wasn't happy to take the shares in exchange for doing it, of course.

She didn't mention the transaction to Laurent. He knew, of course that she had shares in the lava lamp project. That had been unavoidable, under the circumstances. She didn't expect to see any of the money from the shares that he knew about. These were another kettle of fish. Invested somewhere.

But why would Jean-Louis care who Pammie's father was? How had he gotten involved? She shrugged. No telling. Given that all she had ever seen of the price of the trailer in Grantville since she had handed the bank draft over to Laurent were quarterly interest statements, it couldn't hurt to have a source of some ready cash that she could stuff under the mattress, just in case.

A girl had to look out for herself.

Too Late for Sunday

Written by Michael Badillo



December, 1633, Grantville

"Roberta Allene Haggerty! Come here for a minute, please."

"What is it, Momma?" Allie answered, entering her parents' room. The "please" didn't fool her a bit. Nobody called you by your full name unless you were in trouble.

"We need to talk, honey."

"Bout what?"

Her mother studied her for a moment before speaking. "I'm worried about you, honey. You ate three helpings of meatloaf for dinner, and you've been sick every morning this week." She fingered the rosary in

her hand for a few seconds before continuing. "Are you pregnant, baby?"

"What?" Why would you even think that, Momma? I'm still a virgin."

"Because you've been eating like a horse," Momma said. "And because you've been so sick. I can't even see you under your baggy old clothes. Have you been gaining weight?"

"No, I don't think so."

"Haven't you weighed yourself lately?"

"Why? I'm skinny; we don't even have a scale in the upstairs bathroom."

"Well, use mine then." Momma stood beside Allie while she stepped on the scale and waited for the dial to stop.

"See," Allie said. "I ain't getting fat."

"My God." This came out as a shriek. "How can you weigh ninety-six pounds? Take off that baggy sweater so I can get a look at you. Why do you have to dress like a scarecrow, anyway?" Momma ran her fingers through Allie's unkempt chestnut hair. "You're so pretty."

Allie didn't much like to do it, but she took off her sweater.

Her mother's face paled. "I can see your ribs . . . Your collarbones are sticking out. You're going to see Doctor Adams tomorrow morning."

"I'm *not* pregnant. Why don't you believe me, Momma?"

"I believe you, baby. I'm just worried now, is all."

* * *

Allie walked back to her room and shut off the radio. She was worried now, too. She had never been overweight; in fact she'd always been somewhat on the thin side of normal. She'd lost a lot of weight.

Most people had shed a few pounds since the Ring of Fire, just from walking more often. But she hadn't lost any until just the last few months. Since September she had lost twenty-eight pounds, no small amount for a girl who stood five foot four and weighed less than a hundred and thirty pounds to begin with.

She was worried not just because the weight loss and the eating. She was always thirsty, and always cold. She was also slightly hurt that her mother would think she had strayed from God's plan and gotten pregnant. Even if, after their little talk, Momma said that she trusted her. It still hurt.

She changed into her nightgown and knelt beside her bed, rubbing her hands briskly together to warm them before placing them together to pray.

* * *

Allie had already finished her chemistry quiz and sat thinking. She really needed a good medical project, something with a lot of chemistry that would help her get ahead in nursing school.

The idea of a blood drive occurred to her. She thought it would be a good idea, if the supplies were available. She made a note to see Doctor Adams about how to get started.

One problem solved, she turned to the next. Who should she ask to the prom? No one had asked her yet, but someone might still. She decided to wait.

The ringing bell startled her. She hastily gathered up her books and papers and stuffed them into a worn denim backpack. She chided herself silently for daydreaming. She could get by with it in chemistry, but history class was different. She couldn't memorize every meaningless date that ever got written down. Especially now with two different centuries of current events and the Thirty Years' War happening in Grantville's living room. She was making a low B in history and she didn't want her grade to drop.

Stopping by Mrs. Selluci's desk, she rooted through the pile of graded homework until she found hers. She scooped it up and deposited her ungraded work on top of the other pile. Ninety-one percent she noted, wondering what she missed.

* * *

"Allie, honey, go on in and have a seat." Allie smiled nervously at the nurse and followed her into the cramped office. She shivered as she entered the room.

There were three other people in the room besides her parents. One was Doctor Adams, her family physician. The second was his nurse, Sheila Baldwin. But she didn't recognize the elderly gentleman who sat in the far corner looking at her with what appeared to be great interest.

Their faces were frozen in a look of dread. She could tell her mother had been crying. Her father sat looking glum with his arm around Momma.

"Uh . . ." Allie looked around the room for a place to sit. Doctor Adams indicated a small folding chair. She took a seat and folded her hands primly into her lap.

Nobody spoke for a few seconds. Finally, Doctor Adams cleared his throat and began to talk. "Allie, we've done some tests. I've discussed the results with your parents." He paused. Allie looked at him and then around the room. All eyes were on her.

Momma stood. "Allie, honey . . . angel . . . you have diabetes." She began sobbing.

"But I'm only seventeen!" Allie understood the implication. She planned on being a nurse after high school. She was just months from graduating and her birthday was soon after. She didn't think this was fair. There was only one fate for a diabetic in the seventeenth century. "I'm going to die, aren't I?"

Her father stood up and started to speak. The nurse interrupted. "Maybe not, Allie. But it doesn't look good. At your age it's likely to be type I, insulin dependant. Before the Ring of Fire, it would have been more treatable. But we don't have the technology anymore. Some insulin is available again, but it's still experimental."

Momma jumped at that. "What? I didn't know that. It could save her life." She turned toward the doctor. "Doctor Adams, you've got to do something. You can't just let her die."

"Hold on, Bobby Jean. Sheila only gave you half the story. I'll get to the other half in a minute. But I warn you: It could be dangerous."

"But she'll certainly die without it, right?" Her father spoke for the first time. There was an edge of anger in his voice.

"Hold your horses, Ernest. I said there was another half. And that half is Zijbert." Doctor Adams indicated the man wearing a white lab coat and holding a cane. He had snow white hair and wore a white goatee and mustaches. The man stood. "This is Doctor Zijbert van Trumpe. He's the closest thing Thuringia has to an endocrinologist."

The man looked Allie directly in the eye and gave a slight nod. "How do you do, Miss Haggerty?" His English held a slight Dutch accent.

Allie thought he looked like Colonel Sanders. The thought made her smile in spite of it all. "I'm pleased to meet you, Doctor."

He smiled, showing beautiful white teeth. "Doctor Adams flatters me. I am more of an herbalist really, but I can treat your illness. Let us begin. This new insulin may save your life. You are a minor, but with your parents' consent, we can begin your treatment. I concur with Doctor Adams' diagnosis. Are you willing to undergo insulin therapy?"

Allie's answer was terse. "Rather than die? Of course."

"A year ago," van Trumpe began, "it would have been impossible to treat you. There are several things you can do about type two diabetes, but without insulin, hope for the type ones is slim.

"The insulin we are using is still experimental, as Doctor Adams indicated. Each batch is a different strength, so you have to undergo tests which allow the technicians to dilute it to a given strength. This insulin is weaker than up-time U100 or U500. It is about U10. The lower strength means we can use the larger syringes that are being manufactured now. I have set up a small clinic in the Three M complex. The insulin labs are there too. Your dosing schedule will be really complex and, for a while at least, we will administer your shots from my clinic. If you will come to my office on Monday, we can begin."

When Allie finally left the office, she was tired, cold and scared. But she wasn't too preoccupied with her own problems to notice the thin young man who sat alone in the waiting room.

* * *

"Allie, this is Hugo." Nurse Baldwin introduced the young man Allie vaguely remembered seeing at Doctor Adams' the other day. He was very skinny, with sunken eyes and his skin drawn tight over his cheekbones. She could see the hollow spots around his collarbones. "He has diabetes too. We thought you might like to meet him."

"*Guten tag*," said Hugo. "I am Hugo Sonntag."

"I'm Allie." She held out her hand. To her surprise Hugo took it and bowed deeply as he kissed it. She thought he would be cute if he could gain a few pounds.

Nurse Baldwin set a pitcher of water and two glasses on the table. "We're going to let you two get to know each other. Remember; support is really important. Don't give up hope."

"Is good to meet you, Allie. I also am type one." Hugo's English was stilted and halting, but understandable nonetheless.

She smiled at him mirthlessly. "I'm so sorry."

He shook his head tossing his wavy black mane. "Is the will of God. But I have been taking the insulin. Still, I am alive."

"How long have you had diabetes?"

"For three months." He shrugged. "I should have died, were it not for the medicine."

"How old are you, Hugo?"

"Nineteen."

They talked for hours, just getting to know each other. It turned out that they had some things in common. They had hopes, and dreams, and aspirations. They both loved school. And they both hoped to live long enough to finish it. Hugo dreamt of being an astronomer; Allie wanted to be a nurse. Both of these things required time—time they might not have. By about sunset, they had finished three pitchers of water and had gotten to know each other fairly well. Allie decided that she liked Hugo.

* * *

"This is the best we can do." Doctor van Trumpe held up something that looked like a tiny wine bottle. It contained a cloudy liquid with the slightest pink tint. "Three M extracts it from the organs—the pancreas actually—of slaughtered pigs."

Allie knew insulin came from pigs and cattle, back before human insulin was available, but she was no less squeamish for the knowledge. "Well," she said resolutely, "it's better than no insulin." She squeezed Hugo's hand. In the past week they had become quite close. He wasn't her boyfriend, but lately he was the only person she felt understood how she was feeling.

She looked to her parents. The chairs had been set up in pairs; one for the Haggertys, one for the patients.

"Doctor van Trumpe?" Ernest Haggerty asked, "will this work?"

"Eventually, of course, the product will be pure. It is natural, so it will work." He set the vial down on his desk. "It works now, but the question is how much to use. The concentration is weak and not entirely pure. The effects are not always consistent."

"It's better than nothing." Bobby Jean blinked back tears.

Allie tried to put herself in her parent's position; losing their daughter just as she came of age, but she couldn't.



The doctor went to his desk and took out a small box. He opened it and showed the contents to Allie. It held two glass syringes with huge evil looking needles that appeared to be made of brass. "These are the best syringes we have," he said, offering one to her. "They are large but with the new concentration, it should not be a problem. The needles are replaceable, but not easily.

"You will come here twice a day, before and after school, for your shot. You will not skip a day, no matter how ill you are. We will start by giving you your shots."

Allie relaxed slightly at that.

"But, you must learn to do it yourself someday. So, before you leave here today . . ." He took the other syringe and filled it with clear liquid from another bottle. ". . . you will have to give yourself a saline injection. Like so." He demonstrated on his own arm. Then he picked up the bottle of saline and handed it to Allie. "Your turn."

* * *

Hugo came to stay with the Haggertys shortly after Allie began to take the insulin. He was a down-timer and an orphan, so he didn't have any support net. He had come to Grantville seeking education. He was taking classes to pass the infamous GED when he fell ill.

Since he was so young he had no trade, no stake, and he was too sick to labor and learn one. Ernest and Bobbie Jean took him in. He got on well with Allie and God knew she needed an understanding friend.

They gave him the spare room. Hugo was immensely pleased. He'd never lived in such a fine building before. He lay in the comfortable bed, unable to sleep but not wanting to disturb his hosts. He had faith in American technology. Soon they would have better medicine and he could give himself the shots.

He'd seen the wasting sickness before. Those who got it as a child died, usually starving no matter how much they ate. It was a terrible thing.

Dear Lord, please let this work. Please watch over Allie for me, and the Haggertys. Please allow the medicine to work. Not just for us, but for everyone who has and will have the wasting sickness. Please bless us with your infinite mercy. Please bring us another miracle.

December 29, 1633

Allie's boots crunched in the new snow as she and Hugo marched through the empty cornfield. She was cold to the point of shivering. "Why are you bringing me out here?" She thought when he asked her to walk with him that they would walk hand-in-hand and talk about romantic things.

The only light around came from the pathetic bullseye lantern he carried. "I can't feel my toes, Hugo." He didn't answer. She scanned the horizon, but failed to see anything of importance. The town was behind them. She could see the lights but not much else. "The Moon isn't even out," she added.

Hugo stopped in the middle of the field. Holding the lantern aloft so that she could see, he smiled broadly and spoke. "We are here."

"Where, Hugo?" She knew there was a hint of irritation in her voice. "We are where?"

He swept the lantern around to indicate the field. "Here," he repeated simply.

"Hugo," she replied, the impatience mounting in her voice, "I don't see anything. What do you expect me to see?"

"Stars." He dowsed the lantern.

She looked up. "Oh, my God. They're beautiful. I've never seen the stars like this." Grantville was far from the major sources of light pollution in the twentieth century, but in seventeenth-century Germany, the town sat under an inky black sky. Impossibly bright stars burned in the sky like so many bale fires. "Hugo, they're amazing!"

"They are beautiful." He looked at the ground for a moment before gazing into her eyes. "Like you."

She didn't know what to say. No up-time boy had ever taken her out on a moonless night to show her the stars.

"The brightest one is Jupiter." He looked back to her to make sure she understood. "Is planet, not star. But star south and west, is Alpha Taurii. Mohammedans call it Aldebaran."

She leaned closer to him, snuggling for warmth, but also to see better. He wrapped his cloak over her shoulders.

"To south of Jupiter is *Alpha Orionis*. Is also called *Betelgeuse*. Is brighter than Aldebaran. It is point four magnitude, while . . ."

Allie placed a finger over his lips. "Shh. Talk about the stars, not the math." She grasped his other hand in hers.

He turned toward the eastern horizon and pointed to a small red light. "That is planet Mars. He has two moons, but we can't see them." He turned to her and gave a pleading look. "Up-time stories say you sent machines to fly there. Is true?"

"Yes, Hugo, it is true."

He was silent for several minutes. "Marvelous," he said at last.

Her watch beeped. "Oh my God, Hugo," she declared, suddenly alarmed. "It's midnight. We gotta get home. My parents will be worried."

He started walking toward the town, pulling her hand. "Come," he said chuckling. "Your parents will not worry. I keep you safe."

She laughed at this, but still they hurried.

* * *

Hugo looked over the cathode ray tube sitting face down on a blanket on top of the kitchen table. The television had gone out the week before during a program he'd really wanted to see, and the technician who diagnosed it said that the tube was bad. No replacement parts were available so it couldn't be fixed. Ernest gave him the set after it broke as a project. When it turned out it couldn't be fixed, Hugo sold the chassis—it still had many useful parts that could be cannibalized.

But he kept the tube. He had a plan, and the money he made selling the spare parts would make it happen.

He would take the twenty-five inch TV tube and make a telescope out of it. He had the parts, or most of them, and Mister Haggerty said he could use his tools. He'd even promised to help.

Hugo could buy what few special parts he would need. And hardware, of course. That would be expensive. And most expensive of all would be the silvering of the mirror. He sat down at the table and began to draw.

* * *

Oh my God, what am I gonna do, Allie thought. When she was eight years old and her grandmother was dying she had asked her mother why. "Because it's God's will," Momma had answered, "and you just have to do the best you can with what God gives you." That made Allie feel better somehow. Her mother had added, "that's all you could ask of anyone," to which her father replied "take it in the shorts and press on." That remark had her father sleeping on the couch for a week. Allie had never understood the quip until now.

She had several thick references out and was busy researching

"Allie?" came a voice over her shoulder. She turned to see Matt Tisdale standing behind her. He had his chemistry book in his hand. She recognized Michael Fritz and Kevin Norris behind him.

"Yes, Matt?"

"Could you help us? We're having some problems."

"Yeah," cut in Michael. "This stuff is hard. I don't understand."

Allie gestured toward the chairs around the table. "Sure, I'll help. Sit down, guys." She herded her papers into a neat pile. The three boys took the seats, opening their own texts and getting out their notebooks.

"What's the problem?"

After some discussion of the chemistry problem that had the boys stumped, Matt smacked his forehead. "Ah, now I get it." He turned and looked at his buddies.

"Right on, Allie." "Thanks." "All right" The boys started to leave. Allie let them, because she suddenly felt dizzy.

On the way out Michael blew her a kiss and called, "Allie, you're a genius."

The dizziness mounted. Allie stood up, then tottered a bit. Then she fell with alarming speed.

"Allie!" Michael called. Allie didn't hear him; she passed out before her head hit the table.

* * *

"Allie, how are you feeling?" Doctor Adams seated himself on a small stool and looked up at her from his new vantage point. "You had a little faint. Do you remember what happened?"

"Well . . ." Allie paused. Somehow she was in the doctor's examining room. She was still dizzy and there was a sharp pain shooting through her back. "I was in the library, studying when some boys came along and asked for some help with their homework."

Her mother seemed to appear out of thin air and handed Allie a glass of water. It wasn't enough. She drained the glass. "Can I have more please?" Then Allie turned back to Doctor Adams. "The guys were just leaving . . . I guess I must have passed out. I was really dizzy right before, but I just can't describe the feeling. I couldn't move. I was aware, but my muscles just wouldn't move. My body wouldn't obey." She shuddered. "It was the scariest thing that ever happened to me."

* * *

Hugo had heard of some of these men. Copernicus and Galileo were among his favorites, but the one who fascinated him most was Isaac Newton. He wouldn't even be born for ten more years, but the books said Newton would revolutionize the world. He would invent many things including a new type of telescope. There were illustrations of his design and fantastically realistic photographs that showed the stars and planets as he'd never seen them. He was awestruck.

Hugo didn't remember a time when he wasn't fascinated with the sky. He idly copied the illustration of the Newtonian reflector into his notebook. When he finished he turned back to the text and read about a man named William Herschel. He stopped only to eat a snack and drink a glass of water.

* * *

Allie bounced into the room and Hugo smiled and sighed inwardly. She was so very pretty. But she was rich and above his station, although she'd always been kind to him. She even smelled intoxicating.

"Hugo, would you like to go to the prom with me?"

He couldn't believe his ears. She was a high school student soon to graduate and with a future. He was an orphan, abandoned from day one, and poor as a church mouse.

"Hugo? Are you okay? How is your blood sugar?"

"It is not that. I never expected . . . surely someone in your school has asked you."

"I'm asking you, Hugo."

"Of course." Hugo blinked back tears. "I just wasn't sure you liked me."

"I like you, Hugo."

"No," he blushed. "I mean like *that*."

"I do like you like *that*, Hugo." She leaned forward a little bit further and kissed him.

February 14, 1634

Allie stopped and leaned over panting, her hands on her thighs. "Hugo, I'm tired."

"Just a little farther, Allie. I promise."

"But you can hardly see the stars. There's a full moon out."

"Please," he smiled immensely. "Indulge me." Dim light lit his face.

She didn't reply, but held out her hand again and let him pull her along. He led her into a copse of trees and stopped at a fallen log. He kicked over the log, and luminescent fragments of wood sprayed across the ground.

"You brought me out here to show me foxfire?"

"No. Not quite." He spoke softly but tugged her arm. They continued for another several yards. The thick undergrowth of the glen gave way to a clearing. He watched as Allie walked into the clearing, looking at the glowing debris set out along the ground. She stared at it momentarily, confusion evident on her face. Then she backed up a little, moved around the perimeter of the clearing until she'd lined up the figure that Hugo had spent all morning drawing. "Hugo," she gasped. "That's so sweet."

She stood at the foot of the giant heart picked out in foxfire. The words "*Be Mine*" were spelled out in English, but in a Gothic font. He'd spent some considerable time making this. "Happy Valentine's day, my sweet."

"You've given me the stars." He could barely see the light from the foxfire illuminating her tears. She squeezed his hand. "You couldn't show me the stars in the sky so you brought them down here for me." She seemed deeply touched, but paused as if working something out.

"But how did you know?" Confusion was evident in her voice.

"Your friend Michael. He told me." He stooped and picked up a bunch of wildflowers, cut and bound with a ribbon. He offered them to Allie. "For you."

"Flowers! At this time of year?"

"Hothouse." He stepped closer again.

"But that's so expensive." He gave a noncommittal shrug.

They were now standing face to face, with only the flowers she held tightly in both hands between them.

He leaned forward so that his face was just inches from hers. "I like you."

When they kissed, she dropped the flowers.

* * *

"How's it going, sport?" Ernest looked up from the tiny lenses he was polishing. "You need a snack?"

"I'm fine." Hugo answered amiably. "I'm almost done. The mount works well, but I'm going to have to find a way to make fine adjustments."

"What about a worm gear?"

"Please?"

"A worm gear," Ernest repeated. "It's like a long screw that turns a gear; very useful for small adjustments. Here," he said, showing him the action of a crescent wrench. "It works like this."

After a moment, Ernest muttered, "I sure could use a cold beer right now." He said the words *cold-beer*, as if it were one word, then added, "It's a sad thing to have a German son who can't drink beer." He switched back to his normal voice. "Do you want some water, Hugo?"

"*Ja, bitte.*" Hugo went back to the hand-copied references and discovered that another way to make the necessary adjustments was something called a *friction brake*. He had no idea what one was, but wrote the words in his notebook in case one of the up-timers at the library could tell him. They were getting used to seeing him by now. He'd spent many hours there, copying text and illustrations and asking endless questions.

He was astonished with how much work was necessary to grind the glass blank just to make it spherical. He had yet to make the circle into a parabola, but that could wait. The only thing left to do now was silver the mirror.

"Soon," he said aloud, "it will be done soon."

* * *

"What's happening to me?" Allie demanded of Doctor Adams.

"At first, we thought it was inconsistent batching, but other patients would have had a problem as well. Zijbert thinks it might be MODY."

"Motie?" Allie asked. "Like the novel?"

Doctor Adams didn't react to the reference. "MODY," he repeated, somehow, against all logic, pronouncing it in all caps. "Mature Onset Diabetes in the Young. Sometimes a patient presents as a type one but in reality is another type altogether. Typically, MODY patients require less insulin. We may even be able to treat you with other drugs. The up side is that your prognosis looks much better than a type one."

"What about Hugo?"

"Now, Allie, you know I can't discuss another patient with you."

"But he's my boyfriend."

"I'm sorry, Allie, but I really can't say. It's too early in any case, but I have to tell you, you both look much better than you did. How are you feeling?"

"Fine." Her answer was flat and somewhat cold.

He patted her on the back of the hand. "I'm sorry, Allie, we all are. I know it's not fair but there is not much we can do . . ." His voice trailed off weakly.

She stood mute, staring at him for several minutes. The silence continued until Nurse Baldwin came into the examination room.

"Hey, sweetie," she said, looking at Allie and smiling. "Congratulations."

Allie gave her a look. "For?"

"Graduating high school, hon. It's one of the most important things you can do in life. Besides, it keeps your mind busy. You gotta plan your future; when you beat this thing . . ." She stopped when Allie stiffened. "Hey, and you'll be eighteen soon. You'll be an adult."

"Yes," Allie paused. "I will. Which brings us back to the point." She turned to Doctor Adams and gave him a serious look. "If you can take me off insulin, it will mean more available for Hugo. I think he could use more. I will quit taking the injections if you think I should."

"I think we should try it." He wrote his recommendation in her chart. "But don't worry about Hugo. The insulin is working well enough for him. You've surely noticed how much he's filled out in the last six months."

"Yes," Allie said. *Indeed I have.*

May 22, 1634

"Happy birthday." Allie's mother handed her a small package wrapped in brown paper. "It's not much," she apologized, "the insulin is so expensive."

"Oh, Momma," Allie was overwhelmed. The reminder that they had been paying for her and Hugo's insulin made her feel deeply obliged. "You didn't have to."

"We want to," her father cut in. "We love you." He turned to Hugo. "Both of you."

This made Allie cry until her mother stopped her.

"Come on, baby, open it."

Allie tore into the wrapping and recovered a small jeweler's box. She opened it and gasped. She set the

box down beside her tiny slice of birthday cake and took out a silver locket on a chain. She opened it and smiled tearfully. There was a small painting of Hugo set inside.

"Oh, Momma, Daddy . . ." She sniffled, kissing both of her parents. "It's beautiful."

Hugo took the locket and fastened it around her neck. He kissed her lightly on the nape and whispered into her ear. "I have a surprise for you, as well."

He picked up a small decorative bag, the kind used before the Ring of Fire for last minute gifts. This one was well used and worn. "Happy birthday, my love."

She dug into the tissue paper and produced a silken scarf in emerald green. "It's lovely," she said taking it by the ends to tie it around her neck. Hugo took it from her instead and tied it over her eyes.

"There is more, *mein Engel* ," he said when he was done blindfolding her. "This way."

* * *

Allie strained her ears in a vain attempt to tell what Hugo was up to. He had something planned—something big. It was about ten o'clock at night and the rest of the family followed closely, whispering excitedly amongst themselves. When Hugo stopped her in the middle of the yard, her parents cooed in delight over some unseen wonder.

When he removed the blindfold, she saw the wonder itself. He had made a telescope.

"Surprise, sweetie," her father sang out. "We've been working on it for months. Hugo wanted to keep it a secret, for your birthday."

She circled the instrument, regarding it with unbridled curiosity. It sat on a three-legged mount about three feet high. The body was a large octagonal wooden box about five feet long and was attached near the middle by a t-shaped pivot on top of the stand. One side of the "t" held the instrument; the other held a counterweight. At the top end, there was an eyepiece and another little tiny telescope that looked like a rifle scope. It was a striking medley of future and contemporary technology. She thought it was quite beautiful.

"Here, let me show you." Hugo gestured to the scope. "It is a fifteen-inch spherical reflector. The focal length is two-hundred inches, but I've put an aperture stop at fifty inches to reduce the spherical aberration."

Allie had no idea what all that meant but she smiled and nodded.

He continued, "I meant to regrind the mirror to a parabola, but I didn't have time. I wanted to show it to you on your birthday. When I get time, I will finish it."

He stepped up to the telescope and peered through the spotter scope. He made a few adjustments and peered into the eyepiece of the main scope briefly before stepping aside for Allie. "That's Jupiter. See, those three dots are Europa, Ganymede and Io."

It was chilly outside, even in the spring. Allie shivered and Hugo threw his cloak over her and snuggled her close. They took turns peering into the eyepiece, Hugo explaining the significance of thing they looked at. He told her stories of the stars and named them in Arabic. They stayed until the wee hours, long after her parents retreated to the house, and made love for the first time under a sky full of blazing stars.

It didn't occur to her to feel guilty. She didn't feel she'd done anything wrong. She felt God would understand that two lonely desperate souls needed each other.

* * *

Hugo collapsed suddenly five days later, while walking home after having morning shot. He passed into a coma on May 27, 1634, Gregorian and died seven days later, on a Saturday. He had been taking Duncan Cunningham's insulin preparation for nine months. The intensive therapy, which had originally been so successful in his case, failed and his condition suddenly worsened for no reason Doctor Adams could figure out. But regardless of the cause, the smell of ketones on his breath told Jeff that he was losing his battle for life.

Doctor Adams could do nothing and felt the helplessness that haunted the families of his patients when all had gone wrong. The autopsy proved nothing conclusively but he was pretty sure that the cause of death was ketoacidosis. Why Hugo quit responding to the insulin, he would never know.

There was a small funeral service, attended only by the Haggertys and Doctor Adam's medical staff. They respected Allie's wishes. Hugo was buried next to her ancestors in the Haggerty family plot. His headstone was granite, simple, bearing only his name, the dates, and a simple epitaph— *Too Late for Sunday*—in German and English.

July, 1635

Allie walked briskly along the sidewalk, passing storefront after storefront, ignoring them all until she reached the clinic. She stopped and checked her scrubs, patting down her seams and flicking away a piece of unwanted gray lint. She liked the pink and white candy stripers that were the virtual livery, to choose a down-time word, of nurse interns.

She was already half way through nursing school. She had sent a letter to Mrs. Cunningham of Three M Labs explaining that she wanted to carry on Duncan's work. And she'd gotten a reply. They'd offered her a job, contingent on her finishing school—something she had every intention of doing.

She sighed deeply and looked up at the facade of the Ancel van Trumpe Diabetes Clinic, then entered the foyer and passed the row of memorial plaques to the patients who had died. The first was of Hugo. It was a good likeness of him, smiling as always. She stroked the locket with his portrait. She still wore it and had promised herself she always would. A tear rolled down her cheek as she reached the plaque dedicated to Doctor van Trumpe's son, who'd died of diabetes also. It was an excerpt from Alfred, Lord Tennyson's *Ulysses*, Allie's favorite book. It had become the *de facto* motto of the clinic:

*Come, my friends,
'Tis not too late to seek a newer world.
Push off, and sitting well in order smite
The sounding furrows;
For my purpose holds
To sail beyond the sunset, and the baths
Of the all the western stars, until I die.*

Allie swallowed the tears and squared her shoulders. Then she stepped into the noisy room full of patients and crossed over the threshold of adulthood, into a newer world.

Dark as a Dungeon

Written by John Zeek



Henry Johnson was happy to see the three horses the family owned in the field. That meant that Anse and Hagen were back from the medical center. Maybe, just maybe the waiting was over. Henry pointed the horses out to Wendel Schultz and Suse Eckhard who were seated across the tram's aisle. "When we get to the house, I want some time to talk with your Uncle Anse and Hagen before you start asking for stories about the war. If you'll leave us alone for a bit, I promise not to interrupt when Hagen gets to the good parts. Deal?"

Suse looked a little hurt, Henry knew she had a bit of a crush on Hagen, and she tried to monopolize his time.

"No more than an hour, Suse. You and the boys will have Hagen all evening. Wendel grab your brother." His brother, Gerd, as usual, was seated directly behind the tram driver.

Henry was glad to see Hagen sitting alone on the porch steps when he walked up the driveway. Better to find out what had happened before he had to face Anse.

"Hi, Hagen." Henry sat on the steps beside Hagen. "How was the trip to the medical center?"

Hagen smiled. "I passed. My leg is completely healed. When my leave is over in two weeks, I can return to the TacRail Battalion . . . no, I mean the TacRail Regiment. The word came in the mail this morning. We're a regiment now. "

"And Anse? What did the doctor have to say about him?"

Hagen's smile disappeared. "Not so good, Herr Johnson. The doctors will not clear him to return to service. In fact, they were talking about a medical discharge."

"Damn," Henry muttered under his breath. "Was it the eye chart again?" Anse was blind in his left eye from splinters.

"No. The chief has a waiver for the eye chart. It was the bucket of sand." Seeing Henry's questioning look, Hagen continued. "You have to be able to pick up a fifty pound bucket of sand. You have to do it twice, once with each hand. Herr Hatfield can't do it. The wound in his arm tore out too much muscle. His hand won't close completely, either."

Henry knew Anse was going to have problems with a nasty wound in his bicep and most of three fingers gone from his left hand. But this was worse than he had expected. "How's he taking it?"

"Not good Herr Johnson. Not good at all. The worst part was the ride home. The chief was not able to hold the reins in his left hand, and I had to drive the wagon."

Yes, Henry thought, that had to be bad. Anse never likes anyone to do things for him. "Where is he? I need to talk with him."

"He is in the living room. He just sits and looks at the television. It is not on; there is no program. He just sits and stares at the blank screen. I am worried about him. I have never seen the chief like this."

"I'm worried too, Hagen. But it is up to us, his friends, to pull him through this. He is a strong man inside; it'll work out." Henry stood and started toward the front door. "Hagen, I want a bit of uninterrupted time with Anse. Why don't you entertain Suse and the boys? Keep them outside for a while."

* * *

Henry wondered why he was thinking of gladiators and lions. As Hagen had said, Anse was sprawled on the sofa looking at nothing. He looked terrible. He was wearing his oldest coveralls; almost worn out at the knees. There was even a small rip in the leg. It was very obvious that he hadn't shaved for a couple of days. He had wrapped a bandana around his head to hide his ruined eye. It looked more like he was pretending to be a hip hop gangster than anything else. Henry walked over and sat in the easy chair. There was a long enough period of silence for him to start to fidget.

"Hello, Anse," Henry said.

Silence.

"I said 'hello, Anse.' The normal response is 'Hi, Henry. How was your day?'"

Anse looked around. "Sorry, Hank. I didn't hear you come in. How was your day?"

Anse sounded like a puppet just going through the motions. "My day was fine. How was yours?"

Silence was his answer. "Come on, Anse. Talk to me. I know you went to the medical center. I talked to Hagen so I even know what they told you. So talk to me."

"You wouldn't understand."

"I wouldn't understand?" Henry banged his cane on the floor. "I've walked with this stick since 1968, and I wouldn't understand. Wake up, Anse. This is me you're talking to."

Anse looked up. "Sorry, Hank. I guess you would understand part of it. But you always worked with your head, being a school teacher and all. I've always worked with my hands." He held out his ruined left hand. "Now look at me. What good am I now?"

"So are you going to sit around feeling sorry for yourself or are you going to do something about it? Hagen told me about the bucket of sand. Do you want to get out that old set of weights in the basement and start some physical therapy? Give it a couple of months and we can build up the strength in your arm." Henry could see Anse was struggling not to lose his temper. *Good. Maybe a good mad is what*

he needs.

"I don't have time to do any physical therapy. They're throwing me out of the Army."

"I doubt that. Maybe you won't be a field man any more, but surely Colonel Beth will need you to train engine drivers. You're a good trainer. You trained all the drivers in TacRail, and you helped train all the brakemen. Shoot, you even trained the loaders and loadmasters. That new transportation school in Magdeburg sounds like the perfect slot for you."

"I don't want to be a trainer any more, Hank. I trained Hagen and the three other boys from TacRail who were wounded at Ahrensböck. But I was there with them. I don't want to send boys that I trained out to get killed or wounded when I can't go myself.. It would tear me up if they got hurt."

Henry understood. He had sent men into combat, those many years ago. He tried reason. "Anse, you're fifty-four years old. You had to expect this was coming. You can't go running around playing Alvin York forever."

"Charlie Swartz is still in TacRail and he's almost seventy. I was hoping to last a few more years."

"Charlie Swartz works behind a desk. Do you want a desk job?"

"No desk job."

Henry was getting angry with Anse's stubbornness. "Okay. What if you are forced out of the Army? It's not like you're going to starve. You'll always have a roof and a plate here, and how many companies have you invested in besides Pat's gun factory . . . six or seven? You'll have a good income to retire on."

Anse gave Henry a pitiful look. "That money is for my old age. And I want to leave something to Wili's kids and Suse."

"So you want to keep working. I can understand that. All right, let's look at the possibilities. With all the new industry starting up there are a score of places for a man like you. You have proved you can supervise and lead men."

"It's not the same and you know it. I don't want some charity job. And that's what they'd be. 'Oh, look at the poor wounded soldier.' Bah. I might as well get a lawn mower and go back into the lawn care business. That, at least, is honest work."

Henry tried a joke. "I don't think that would work, Anse. Most people have goats or sheep to do their lawn mowing."

Anse gave him a look that would freeze water. "You're not helping, Hank. Besides, that was just an example. I want real honest work."

"Okay. You want real work; you could always go to Suhl. Ruben Blumroder offered you a job running his gun shop. Since he was elected to the state legislature he needs someone full time. Or, Pat needs an assistant in his factory. It would be a bit like your old job as a foreman for Ford. Shoot, Gary Reardon offered you the same job in his bolt factory. There are three jobs in Suhl alone, and they aren't charity jobs. You know, I think the change of scenery might do you good."

Anse slouched lower on the sofa. "I'll think about it."

Henry had to work to keep his temper under control. "Anse, at least clean yourself up. You can't mope around the house all day every day. You are starting to worry me and I know you're worrying Dora. Besides, it sets a bad example for the kids. You know how Gerd worships the ground you walk on."

Anse was still staring off into space. "There's another thing. When Wili joined TacRail, I promised Dora I'd take care of him; now look at me. If anything were to happen to him . . ."

"Dora would understand. She knows you and Wili are closer than brothers. Shoot, Anse, she treats you like the brother she never had. So how about cleaning up a little for her? You've even got Hagen worrying. We're all family here, including Hagen, so for your family pull yourself together."

"Hank, I know you're trying to help, but leave me alone. I have to work this out for myself." Anse got up and walked into his room.

* * *

Dora Schultz looked up when the door slammed open and Henry stormed into the kitchen. She had never seen him this angry with anyone, much less Anse.

"I'm getting tired of this shit," Henry muttered. "He can't spend the rest of his life just loafing around feeling sorry for himself." Then he looked around and saw Dora. "Sorry, Dora. But Anse got to me."

"Ja, Henry. He is getting to me too. He insists on wearing that ugly bandana and refuses to wear the eye patch I made for him. He wears the same two sets of coveralls; they are the oldest he has. I must have washed them twenty times since he came home. He has stopped shaving. And worst of all, he doesn't *do* anything. Before he was always busy. What are we going to do? This is not good for him."

"I'm calling out the big gun." Henry waved away any question Dora might have asked and went to the telephone.

Dora had no idea who he was calling, and the one-sided conversation she heard gave her no clue. Henry described Anse's condition and actions. Then he finished with, "Yes, he's here now. He is just staring at the wall in his room. Would you? Thank you, I'm sure it will help."

When Henry hung up the phone, Dora started to ask but he held up his hand. "Don't ask. If this goes wrong Anse can only blame me; you had nothing to do with it." With that cryptic comment Henry walked off, heading for his shop in the basement. Dora's questions were answered forty-five minutes later when the door bell rang.

* * *

Dora had never had any dealings with Captain Leonore von Wilke, but knew who she was. The captain commanded the communications people in the TacRail Regiment. She had also been the main subject in many of the gossip sessions at the Twirl and Curl Beauty Salon. The Twirl and Curl was like the village well in her Dora's old home. It was better than Cora's Café for gossip.

Leonore was, if the stories were true, a nobleman's daughter, a former camp follower, a thief and looter, a former madam in a bawdy house and finally a CoC organizer before joining TacRail. Dora wasn't sure if she quite approved of Leonore, and had worried when Anse had acted as her escort to a number of dances in town.

To add to her disapproval, Leonore was not dressed properly for visiting. Dora could have understood

if the captain were wearing a uniform; pants were part of the female TacRail uniform after all. But Leonore was wearing what looked like a locally-made copy of an up-time pants suit. A copy made from what looked like green velvet. Her trousers were tucked into high black leather boots. The handle of what had to be a dagger protruded from the right boot. She was also wearing a rather large revolver. Dora had definite ideas about women carrying a pistol; it should be hidden. She always carried her own revolver in her pocket. But she would be polite. "Allo, Captain von Wilke. May I help you?"

"Good afternoon, Frau Schultz. I am here to see Herr Hatfield. Is he in?"

Dora nodded. "In his room. I will get him."

"Don't trouble yourself. If you will just point the way, I want to surprise him."

Dora pointed across the living room to the door of the home office Anse had converted into a bedroom. "He is in there."

"Danke, Frau Schultz."

Leonore walked to the door, twisted the doorknob and kicked it open. "Andersen Hatfield, your manners are terrible. You're supposed to stand when a lady walks into the room. And you're supposed to call your friends when you get into town."

Then she slammed the door.

For the next twenty minutes Dora could hear Leonore telling Anse his bad points. She started with his uniform and worked her way from there. She included his manners and his attitude. Then she started on the way he was dealing with his wounds. She never descended into profanity and never repeated herself. Her voice never became shrill but was loud enough that the whole house heard.

Finally the door opened and Leonore stepped out, turned and added in a conversational tone, "I expect you to be shaved and dressed in a clean uniform in fifteen minutes. I'm only going to be in town for a week and I want a handsome hero to walk with me while I shop. Move it, Andersen. I'm waiting."

Leonore walked over to where Dora stood gawping in amazement. "Frau Schultz, I want you and any other TacRail wives and girlfriends to know I am returning to Magdeburg in a week. If you want to send mail to your loved ones, I would be happy to see it gets delivered. And for your personal information, it looks like I'm going to be assigned to the transportation school in Magdeburg. I intend to ask for your husband as a trainer for brakemen."

Dora could barely whisper her thanks. What was this woman?

Fifteen minutes later, by the clock, Anse came out of his room. Dora was surprised to see that he was dressed in the new dress coverall she had made for him. The one with the embroidered rank and unit badges. The very coverall he had refused to wear because it had copies of his ribbons, both from Vietnam and his current service. His hair was combed and his goatee and mustache neatly trimmed. He was wearing the neat black eye patch she had made. He looked splendid.

Leonore held out her hand. "Well, Andersen, you look passable. I have a carriage and driver in the drive way. Would you like to take me shopping and to dinner?"

Anse took Leonore's hand and walked her to the door. Dora wasn't sure exactly what magic she had

just seen worked, but she knew that she totally approved of Leonore von Wilke.

* * *

Anse was smiling, but it wasn't his familiar grin. "Andersen," Leonore said, "don't pretend with me. I can see right through you. You may be here with me, but your mind is still on that battlefield."

Anse looked startled. "No, I was just thinking about the future and how I was going to fit in to it. The battle is over."

"Bullshit, to use a fitting American phrase. That is pure bullshit. Your wounds are not the problem. And you know it. Talk to me Andersen."

"Leonore, you don't know what you're talking about." Anse held up what was left of his hand. "Pretty, ain't it?"

"If you're trying to shock me, you failed. I've seen worse. I stood over the body of my dead husband, torn apart by a cannon ball. I prepared him for burial. Do you really think an injured hand is going to shock me? Ha."

"It is not just injured. It's half gone."

"So you work with the other half. But the hand is not the problem; it is how you're dealing with your experience of the battle where you were injured."

"You keep saying that and it simply isn't true. I've been in battles before."

"Wholesale killing battles, like Ahrensbok? I doubt it. You Americans did not fight like that when you were in your up-time army."

Anse puffed up with anger. "First off, lady, I was a Marine, not in the Army when I was up-time. Second, we fought some pretty nasty battles and they never bothered me."

"Bullshit. I was a soldier's wife. I know about the nightmares and cold sweats when you remember the men you have killed. Did you see some of the Vietnamese for years afterwards? And you are still seeing Ahrensbok every night. You would not be the man you are and not see it. The hand is just an excuse."

"Not every night."

Leonore knew he was finally going to open up.

"Leonore, if I hadn't of pushed so hard we wouldn't have even been in that battle. I had to show everyone what TacRail could do. Then I teased Frank Jackson and got him angry enough to put us in the battle line. If I had stuck to my job I wouldn't have gotten my men wounded and killed. And in the end we weren't really important. The real battle was on the other end of the line."

"I've read the reports of the battle; you weren't totally useless. You had one man killed from your original party. The two Jaegers you lost might have been killed whether you were there or not."

"Don't try to rationalize it. It won't work. I know I've tried."

"Andersen, the problem is you are not a warrior." Noting Anse's reaction, Leonore quickly added, "A

warrior would puff himself up and strut around shouting about the glories of war." Leonore reached out and touched the decorations sewn on Anse's chest. "These mean nothing to you, do they?" She touched the rank emblem on his collar. "And this means even less."

"Well, I like the rank."

"Oh, to be sure. You like to be able to talk to both officers and common soldiers as their equal. But you would be happier in a set of faded coveralls with grease stains, as long as they had the train crew patch." Leonore touched the red circle on Anse's sleeve.

"Well, yes, I am proud of the train crews."

"Andersen, you are not a warrior. A warrior would bask in the glory of his awards. And lecture on the honor of combat. No, Andersen. You are a soldier. You see war as a necessary job, a dirty job, but a job that needs doing."

Anse thought about her words. Finally, he broke the silence. "You're a pretty smart lady. Did you just figure that out?"

"I knew you were a soldier the day you and Sergeant Rau came to teach my telegraph girls self defense. You didn't talk about honorable fighting or fair play. You said they were to use anything they had and any method that worked. You told them to fight in pairs and to shoot without warning. To backstab and cheat; anything to keep them alive."

Anse smiled a real smile. "Hey, they're all good kids. They needed a touch of the real world."

"Yes, they are good kids . . . and some of them will live to be a lot older because of you."

They rode in silence for a while. Then Anse gave a sigh. "You're right. I do see the battle some nights when I try to sleep."

"Will it help to tell me?"



"There was this one French sergeant that stands out. He was the bravest man I ever saw. He walked across that field with nothing but a little spear. He was following the orders of fools and he knew it. He was an older man. We were tearing the French line to pieces and this sergeant just kept leading his men. He made it across three hundred yards of pure hell and I killed him."

Leonore waited to see if there was more. Then she touched Anse's shoulder. "If you had not shot him, would he have reached your men? Would he have continued to fight, maybe killed or wounded some of your people?"

"Sure. You could tell he was a fighter. He wouldn't have surrendered without orders."

"Then I am glad you shot him. It was the right thing to do. Brave or not, he was the enemy."

Leonore could tell her words had affected him. "Andersen, what would your Johanna have done if you acted like you have been?"

"Leonore, that's fighting dirty. But she would have kicked my ass."

"Yes, it is fighting dirty. But I had a good teacher. Consider your ass kicked. You are too tall and I had the cobbler put steel caps in the toes of my boots."

Anse grinned. It was almost the old Anse grin she remembered.

* * *

Henry was surprised to find Anse and Hagen at the table for breakfast the next morning. Hagen being there was not the surprise; he had been having breakfast with Henry since he had arrived more than two

months before. But Anse had been sleeping in for most of the same period. Sleeping in until noon, if the truth was told. Anse was not only up, but dressed in a neatly ironed chambray shirt and blue jeans. Even more surprising, Anse had dug out the old manual typewriter from the basement and was banging away on it one handed.

"Good morning, Hank," Anse said with a grin. "Just a minute and I'll clear this stuff out of your way. I'm just finishing up." He rolled the sheet of paper out of the typewriter and signed his name to the bottom of it.

"You're bright and chipper this morning for some one who came in as late as you did. I was up getting a drink at two and you were still out."

"Yeah. The meeting ran late."

"Huh?" Henry said. "What meeting? I thought you were out with Leonore?"

"I was, but we went to a meeting with Ruben Blumroder and some of his cronies. You know what they say, once a political organizer always a political organizer. And Leonore was a good organizer."

Henry was still trying to make sense of this. "So you went shopping and after dinner you went to a political meeting?"

"Naw. We skipped the shopping and we ordered dinner in. We ran into Ruben on our way to town and the meeting just grew."

"It sounds like an interesting evening."

"No, it doesn't. It sounds boring as hell, but it wasn't. Ruben and Leonore know a lot about the politics behind this war we're in." Anse picked up the typewriter and carried it to the cabinet, then started to gather his papers.

Henry looked at the papers. He knew Anse was a slow typist when he had both hands, now. . . . "Did you get any sleep last night?"

"Not really, I fell asleep about four. Woke up around five thirty and have been up ever since. I started on this about six, after I got dressed." Anse waved the papers.

"May I ask what was so important you started typing at six o'clock in the morning?"

Anse smiled. Henry could tell that he was bursting to tell his secret, but wanted to act mysterious. "My future, Hank. It's my future."

Hagan stood up and started walking to the door. "Herr Johnson, Chief, if you will excuse me I am going to watch the morning news. I have already heard this. Twice."

Henry waited until he was sure Hagen was gone. "Anse you were pretty down yesterday. This is a big change. Are you sure you're all right?"

Anse's grin faded. "I'm getting there, Hank. I know I'll have some bad days ahead, but I am getting better. I appreciate you and Dora trying to help. I know it was hard on you guys."

"Hey, we're family. We care what happens to you."

Anse's smile was back. "Still, I was making it rough on you. I guess it took Leonore to make me really look at what I was doing to the people around me. The people I care about. She has a way with words."

"That she does. She surely does; I could hear her down in the shop. She has a very good vocabulary too. Now what is this about your future? What are you planning?"

"That's why I was reading too late last night. I was reading military regulations; I wanted to get this right." Anse flipped over the first sheet. "This is my application for medical retirement. If the army ever gets around to paying some kind of pension, I'll be eligible."

"Okay. That's a good first step. What are the other papers?"

"This is a letter to the Suhl City Council. I am applying for citizenship. I took your words about a fresh start seriously. I'm moving to Suhl."

Henry would be sorry to see Anse go, but anything was better than the funk he had been in.

Anse continued, "This is a letter to Pat about his job offer; saying thanks but no thanks. And this is another to Gary Reardon saying the same thing.

"So you took Ruben's offer? You're going to take over his shop?"

"Sort of," Anse answered. "Just until I get my Suhl citizenship, then Ruben is going to have one of his cousins come in and run the shop."

Henry decided to sit down. This was going to get complicated and Anse was dragging it out. "Okay, cut to the chase. What are you going to do after you quit working for Ruben? And don't string it out. I want to know now, not to hear a long shaggy dog story."

Anse grinned. "I'm going into politics. We worked it out last night."

Henry was flabbergasted. Anse was one of the most non-political people he knew. This was bad. "We worked it out . . . as in you, Leonore and Ruben?"

"I did mention there were a couple of Ruben's friends at the meeting, didn't I? One was one of Francisco Nasi's people from intelligence. Another was Jorg Hennel, the CoC guy I met in Suhl."

Henry had to set his coffee down. This was worse than bad. One of Nasi's spies, the CoC, and Anse going into politics. This was really bad. He waved for Anse to continue.

Instead of continuing, though, Anse got up and went to the door. After opening it a crack and peering out, he closed it and turned back to the table. "I didn't tell Hagen this part. He doesn't need the worry. What do you know about the gun trade in Suhl?"

"Just what you and Pat have told me. And, of course, there was your trip two years ago to investigate the illegal gun trade. That whole 'mutiny' business has been the talk of the town ever since." Mutiny, hell. Anse had legalized an uprising that left a body count near a hundred.



"Yeah. Well, selling guns to the Austrians wasn't really illegal then, just stupid as hell. And it wasn't really a mutiny, just a couple of idiots using some hotheads to cause trouble. That got straightened out. Ruben and the big dealers have all stopped trading with the Austrians, and when he was on the city council, Ruben got it made illegal to sell guns to enemies of the USE. But according to Jorg there are still guns moving out of Suhl that are not going to our people."

"What does that have to do with you and politics? Don't tell me you're thinking of running for office?"

"Not right now, maybe in a few years. No, the gun business is why I'm going back to Suhl. Hank, I am going to be an intelligence agent for Nazi. I was hired last night. It's a real job, a job I can do. The CoC in Suhl is just going to be my cover story. Ruben's shop, Pat's gun factory and Gary's bolt factory are all hot beds of CoC activity and Jorg wants me to help coordinate them. Can you think of a better spot to watch for illegal gun trading than a gun shop and a gun factory?"

"So you're going to be a spy?"

"An intelligence agent," Anse corrected. "Us spies prefer to be called intelligence agents. Besides I'll be more of a counter-spy."

Henry could almost picture it; Anse, with his usual "bull in a china shop" style, would set the CoC's political agenda for Suhl back five years. And he couldn't think of a more unlikely spy. He had to try to talk him out of it. "Anse, don't get me wrong . . . but an intelligence agent needs subtlety and the social graces. Neither of them are your long suit."

"That's not a problem. No one will suspect me of being an intelligence agent. I have a reputation for honesty and straightforwardness. Plus, there are a lot of people in Suhl who like and respect me."

"And there are a lot that hate your guts and spit when they hear your name. Your time as military commander of Suhl wasn't all sweetness and light."

"Don't try to talk me out of it, Hank. My mind is made up. I'm moving to Suhl."

"Okay, where does Leonore fit into this plan?"

Anse looked a bit sheepish. "Hank, you know I love your daughter, Jo, and will always love her. I'll always think of you as my father-in-law and, more importantly, as my friend, my best friend. But we aren't going home to West Virginia. I plan on asking Leonore to marry me when her enlistment runs out."

For a minute Henry felt like Mickey Mouse in the cartoon with the magic hat and the brooms. He had started this by calling Leonore, but now it was out of his control. Some times you just had to stand back and watch the train wreck. And be ready to help pick up the pieces afterward. He extended his hand. "Anse you'll always be my friend. And you'll always be family. If I can help with your plans, let me know."

The Bloody Baroness of Bornholm

Written by Kerry Offord



May 1634, 0430 hrs, in the shadow of Hammershus Castle, Island of Bornholm, the Baltic

"Get ready to jump," the man at the rudder called.

Jesper Hansen tugged his cap down tight and slung his duffle bag over his shoulder. There was a gentle bump as the boat brushed the rocks and Jesper leapt for the shore. Safe on land, he waved the fishermen on their way and headed for the castle.

* * *

He was panting before he reached the top. It was barely a hundred yards from the shore to the castle wall, but it was a climb of nearly two hundred and fifty feet. His destination was the signal line hanging below the guns. When he got to it he jerked it several times, listening for the ringing of the sentry bell.

"Who goes there?"

Jesper squinted at the face looking over the wall. "That you, Jørgen? It's me, Jesper. Drop the ladder. I have an urgent message for the *Lensmand*. The Swedes are coming."

"The Swedes? Stand clear, I'm letting the ladder down now."

Hammershus Castle, the office of Lord Holger Rosenkrantz of Glimminge, Lensmand of Hammershus Len



Lord Holger Rosenkrantz paused at the door of his office. Two men were looking at a map on the table. One of them was a competent officer he could trust — a man who had served with the Swede for several years before King Christian decided to join the League of Ostend. He wasn't so sure about the other man. Captain Lord Niels Gyldenstjerne was one of his wife's kin. So far the man hadn't screwed up . . . but then, he hadn't been given much opportunity. Holger didn't have high expectations of anybody from that family and kept a close eye on his every move. "The messenger says the Swedes intend gathering their invasion fleet at the Ertholmene islands. From there they can strike at the Hammershus, Melsted and Svaneke."

Holger shook his head, and pointed at the map. "Then again, they might make for the beaches to the south beyond Nexø." He turned to his wife's kinsman. "Niels, send a messenger to instruct the militia commanders to deploy their companies to protect the beaches at Melsted, Svaneke, and Nexø. They'll have to defend their areas with what they have. We can't spare them anything. The Hammershus is the seat of my power as Lensmand of Hammershus. If I lose the castle, I lose the island." He looked pointedly at Niels. "And more importantly, I lose the income from the tenants."

Holger waited until Niels left before turning to Mads Friis, his artillery officer. "Now Mads, how best can we defend the Hammershus?"

The next day, Christiansø, one of the Ertholmene islands, twelve and a half miles east of Sandvig

Johann Fabricius leaned his rifle against a rock and sat down to eat. All around him men were already engaged in the important task of feeding their faces. He let a chunk of bread soak up some hot gravy while he cast an eye over the anchorage between the islands of Christiansø and Frederiksø. The natural harbor was packed with small boats, transports, and the escorting frigates. "How big did you say the beach at Sandvig was, Matthias?"

"Well, you've got to remember, I wasn't more than eight when I was there, but I guess it must be a couple of hundred yards wide."

Johann turned back to contemplating the flotilla of small sailing smacks and barges. "It's going to be a mess with all those boats trying to find somewhere to land."

"Yeah, a right mess."

"Mind, it's not our problem."

"No, not our problem," Matthias Delp agreed.

"We aren't paid to worry. That's what sergeants are for."

"That's right. Let Sergeant Fels worry."

Johann glared at his friend. "Matthias, I get the feeling you're not taking me seriously."

"Oh, I'm taking you very seriously, Johann. Let the sergeant worry about finding us somewhere to land. We can worry about the fact our boat draws over four feet. That means we'll be jumping into water at least that deep."

"That is something to worry about. How deep will the water be at the back of the boat?"

Matthias shrugged. "I told you I was only eight when I was last at Sandvig. I don't know. It could be anything up to five or six feet."

"Matthias, none of us are tall enough to jump into five or six feet of water with a full war load."

"That's my point. Worry about something you can control. I'm planning on being near the front of the boat."

The next day, 0530 hrs, Hammeren hills, Bornholm

On a good day, through a good telescope, a person on the heights of the Hammeren hills could see the fishing boats sailing in and out of the anchorage at Christiansø. Sergeant Knud Lauridsen watched the Swedish fleet set sail for Bornholm. He watched long enough to get an idea of numbers and their probable heading before securing his telescope. Then he grabbed his rifle and ran down the hill to warn his captain.

1000 hrs, off Sandvig, aboard the Holmsund

Back in basic training Sergeant Major Hudson had said that battle plans never survived contact with the enemy. Right now Johann wasn't sure he wanted to be around when they finally did make contact. First there had been the layover on Christiansø waiting for the forces to gather. That had gone two days over schedule. And now, in spite of the day having started out in bright sunlight, it had started to rain. Worst of all, the wind had moved around to the south. Instead of a relatively straightforward passage of two hours the fleet of shallow draft boats now had been forced to keep changing tack to make headway. The journey to Sandvig was taking forever, and the constant rolling and pitching of the flat-bottomed *Holmsund* was taking its toll. Johann had joined the USE Marines to get away from the dull tedium of the army. Right now, with his head hung over the side of the boat and loosing what was left of breakfast, he'd love to have to deal with dull tedium. So far the world was staying faithful to another of the Sergeant Major Hudson's favorite sayings, "if anything can go wrong, it will."

* * *

"Fix bayonets. Loosen tampions," Sergeant Fels called.

Johann jerked his body upright. He felt light-headed and sick. Matthias, seated beside him, looked green. It took several repeats of the order from Sergeant Fels before Johann figured out what was happening. He stared landward. Unfortunately, he had an uninterrupted view of Bornholm. The *Holmsund* was at the front of the flotilla heading for the beach.

He licked the rain dripping down his face and ran his tongue around his suddenly dry mouth. The rain reduced visibility, but not enough that he couldn't see the clouds of white smoke that suggested that people on Bornholm were shooting at him.

He fumbled to fix his bayonet to his rifle and then he loosened the plug that kept rain from running down the barrel. He didn't want to remove the tampion just yet. It was the only thing stopping water getting into the barrel. Loosening it meant it could easily be removed when needed, or in an emergency, shot off.

* * *

There was a bump and scrape as the boat hit the beach. Johann was into the water before Sergeant Fels finished his call to start the attack. As he sank into the chest deep water he shuddered. It was cold. Holding his rifle high above his head he started for shore.

His first step was painful. He'd stepped into some branches under the water and discovered that they'd been deliberately sharpened. He could feel the men behind crowding him, threatening to push him into the obstacle. "Quit pushing. There's something in the water."

He lifted his right foot high before stepping forward this time. "There're obstacles under the water. You're going to have to step high," he called over his shoulder.

It was slow and painful, but eventually he made it to shore. He glanced behind to check that he wasn't alone. He wasn't, but there were a lot of bodies floating in the sea.

The first objective was the Danish position behind a low stone wall about a hundred yards inland. He removed the tampion, lowered his rifle, and joined everyone else advancing on the Danes.

* * *

Over to his right Johann could see Swedes fighting to cross the wall. They were opposed by men with

pikes and were having trouble. He angled toward them.

Suddenly a dozen armored Danes stood up behind the wall. They were pointing small handguns at the Swedes. In seconds there were clouds of smoke and over a dozen Swedes lay dead in front of the wall.

"My god, revolvers. Where did they get those?"

"The same place everybody else does. Burke's catalog has been selling cap and ball revolvers for nearly two years now," Matthias answered.

"But the Danes are our enemies. You aren't saying Burkes have been selling to the enemy. The up-timers have laws against that kind of thing."

"But the Danes weren't our enemy until late last year. That leaves plenty of time for people to have bought them."

Johann looked back to the Danish lines. The wall was now a mass of Danes all pointing muskets at the approaching Swedes and Marines. "Oh, shit!"

At less than fifty yards the whole Danish front became a cloud of gunsmoke. The Swedes charged. Immediately Captain Finck led the Marines in their own charge.

* * *

"Fuck." The hole was knee deep and Johan pitched forward, wrenching his knee, while the weight of his pack knocked the breath out of him. For a moment he was stunned. He'd stepped into a pit about two feet square with several sharp wooden stakes sticking out of the bottom as well as some stuck into the sides, point down. "Thank God for Calagna and Bauer!" He could even feel the indentation in the metal insole of the C&B combat boots, but it hadn't penetrated. If it had—Johann dry-retched at the thought—his foot would have been speared right through.

"Hit the deck!" Sergeant Fels yelled.

When a Marine sergeant told you to do something in that tone of voice your body reacted before the mind realized what was happening. Johann was flat on the ground with his hands on his helmet when there was a massive roar from the Danish lines.

* * *

Johann tipped his helmet back into position and looked around. He could see Marines and Swedes lying on the ground whenever the white gunsmoke swirled away. Some men were obviously injured stepping into the same kind of trap as he had, while others had been torn apart by the explosion. To his front there were Marines kneeling behind the stone wall firing at targets in the field beyond. Even as he watched he saw a Marine shot while reloading his musket.

Johann struggled to his feet and made for the shelter of the wall. He settled beside Matthias, then peeked over it. "What's happening?"

"The Danes made a run for it."

"I can't see any bodies. Didn't we hit anybody?"

"Yes, but they were carried back by their friends."

Johann looked down at the crater at the base of the wall. "Was that what exploded?"

Matthias nodded. "The Danes had the whole fence line mined with *fougasses*. Dig a hole, put in some gunpowder, and then cover it with stones and stuff. Then you wait for people to stand in front of it.""

Johann looked at the remains that were scattered around. "Yeah. It looks like they've been hit by an enormous shotgun. I don't like this. Traps in the water, concealed pits, sharpened stakes, now this. It's like they have an up-time military manual."

"Not really. The fougasse is *so* last century, and as for the obstacles in the water and the concealed pits, they go back to the Romans. Rather than a modern military manual, I think we're facing a classical historian."

"Modern, classical, what does it matter? Someone seems to know what they're doing, and it isn't anybody on our side." Johann looked across the field. Straight to the east a line of trees ran south-east into the distance. That was where the Danes had run. To the south there was open ground for nearly quarter of a mile. Right up until it reached a hill towering above the field. "We're going to have to take that hill."

Matthias grimaced. "I hope you're wrong. That's Langebjerg. I remember rolling rocks down that hill."

"You worried about a few rocks?"

"It's a pretty high and steep hill, Johann. A big enough rock rolling down that slope could kill a man."

Sandvig

It'd been nearly three years since Colonel Axel Gustafsson Lillie lost his leg at the siege of Mainz. Since then he'd learned to get around on his artificial leg, but he was slow. He wanted his horse. A man on a horse could be seen by his men. He could also see the battlefield. A man on a horse could also easily keep up with marching soldiers. "Erik, where's my horse? Why hasn't he been landed yet?"

"It's the obstacles in the water, Axel. I'd detail some men to clear a channel, but the Danes are being difficult," Erik Wachtmeister answered.

Axel glared. He didn't want to hear excuses, even reasonable ones. He wanted his horse. He needed his horse. He turned his attention to the Danes causing Erik's trouble. They were firing from a redoubt high up on a hill three hundred yards back from the beach. As long as the redoubt remained in Danish hands it wouldn't be safe to remove the obstacles in the anchorage, and as long as the obstacles remained, they couldn't risk bringing in the horses. "I want that redoubt taken."

"I'll get on it right now."

Axel cursed his missing leg again. It should be him walking over to lead his men up the hill. He was going to take casualties, but he was already taking casualties every time those cannon fired. He wiped away the rain collecting on his face. That was another problem. The rain meant his muskets were useless. Fully two-thirds of his men were reduced to mere swordsmen. Well, it was something he'd have to live with.

He returned to his pacing, waiting impatiently for Erik to lead the men up the hill. It was a rocky hill, and

the rocks and grass were going to be slick from the rain. He was going to suffer casualties just because of the conditions. He accepted that but he didn't have to like it, just like he didn't like this whole hasty, ill-conceived expedition. He'd been ordered to take Bornholm. It occupied an important strategic location in the Baltic he'd been told. Well, he knew that was true, but what harm could it do with the siege of Luebeck broken by the up-timer admiral and his iron ships? It was all just politics, a chance to grab a little glory for Sweden.

Axel spat on the ground. So much for glory. He'd lost a leg for glory. And he hoped the rumor he'd heard was just that, a rumor. He hoped the king wasn't really intending to make the American, Sharon Nichols, Baroness of Bornholm. He knew something of Bornholm's history, and after the abuses the islanders suffered when it was mortgaged to the city of Luebeck, he sincerely doubted they would accept even the suggestion of a foreign overlord without a fight.

The Swedes, led by Erik, flowed up the hill. Axel winced when the Danish cannon fired. It had to be canister. It's what he would have used. The lead balls came out like a shotgun blast, killing and wounding dozens of soldiers. However, it'd been a last gasp from the redoubt. He could already see men running out the back way. It was only a matter of time before his men took the position.

Axel started toward the hill. When he got to the low stone fence he felt Sergeant Rambo, his bodyguard, hovering, ready to help him over. "I don't need any help, Sergeant. I'm not a cripple."

Axel sat on the wall and swung his legs over the other side. He searched through the light rain, looking for sign of his second in command.

"I see the lieutenant, sir. He's coming this way."

With renewed energy, Axel made his way up the hill.

* * *

A Swedish soldier walking around the back of the redoubt tripped over a braided string . . .

. . . Inside the redoubt the string pulled the trigger of a snap lock. The hammer fell onto a large percussion cap, and twenty-eight pounds of finest quality Danish gunpowder exploded.

* * *

Hidden in the heather fifty yards away Sergeant Anders Lauridsen cursed all clumsy Swedes. Another few minutes and he could have had caught another couple of dozen men in the blast. He reeled in the braided string and escaped through the heather to where his men were waiting.

* * *

Axel opened his eyes. Fragments of barrel stave gently smoldered a couple of feet in front of his nose.

The heavy weight of Sergeant Rambo rolled off his back and a helping hand hauled him to his feet. All around debris from the redoubt littered the ground. "What happened?"

"The redoubt blew up, Colonel."

Axel glared. He didn't need the obvious stated. Nobody could miss the smoking ruin that had been the redoubt. "What about Lieutenant Wachtmeister?"

"He's inspecting the damage, Colonel."

Axel let out a sigh of relief. He'd feared that Erik might have been caught in the blast.

* * *

Axel took one look at the carnage around the redoubt and left it to the surgeons. To the north the ground fell gently away right up to the coast, where high cliffs stood over the sea. To the east there was a steeper slope right down to the sea. To the southeast the ground rose maybe fifty feet in a quarter of a mile. Except for the low heather there wasn't a lot of cover. "I don't think we can be surprised here, Erik. Leave a small garrison and get the rest of the men down with the main force. We'll move on the Langebjerg next."

"Shouldn't we wait for your horse, Axel?" Erik asked.

"We can't afford to wait. Every minute we delay means another minute the Danes have to raise reinforcements. We strike now."

"Very well, but what about the Germans?"

"They wanted their Marines blooded. Well, they'll get their chance, but not in this battle. Their rifles are useless in this rain. At least my musketeers have swords. Order the Germans to clear a safe channel so we can land the horses and guns."

* * *

Johann watched the Swedes approach. A third of them had pikes, the rest muskets. Matchlocks, he noted. That meant mostly green troops from Sweden with a few veterans as sergeants. It looked like the Swedes were finished with the redoubt and were going to assault the Langebjerg. Johann wished them luck.

Then he saw Captain Finck walking with the senior Swede. "Oh, shit. The glory hound is trying to get us killed."

"He might just be asking what the Swedish commander wants him to do," Matthias said.

"Five bucks says Captain Finck is volunteering us for something."

"We'll know in a moment. Here he comes now."

Captain Finck called to his lieutenants and sergeants. There was a bit of hand waving and pointing. After a few minutes the meeting broke up. Sergeant Fels headed Johann's way, collecting the rest of the section as he passed them.

"Delp, Fabricius, on your feet. The Swedes have decided they want all the glory. We've been ordered to clear a channel through the beach obstacles."

Johann struggled to his feet. .

"What's the problem, Fabricius?" Sergeant Fels called out.

Johann pointed to the ground in front of the wall. "I stepped into one of those pits and wrenched my knee, Sarge."

"Medic!" Sergeant Fels called out. "Take care of this man."

Hans Fleischer hastened to Johann's side and wrapped a support bandage around his knee. "Right. How does that feel?" he asked.

Johann tried to walk. "That'll do it. Thanks."

"Get your pack on and get into line, Fabricius. We've wasted enough time already," Sergeant Fels shouted. "Let's get moving."

1200 hrs, Sandvig

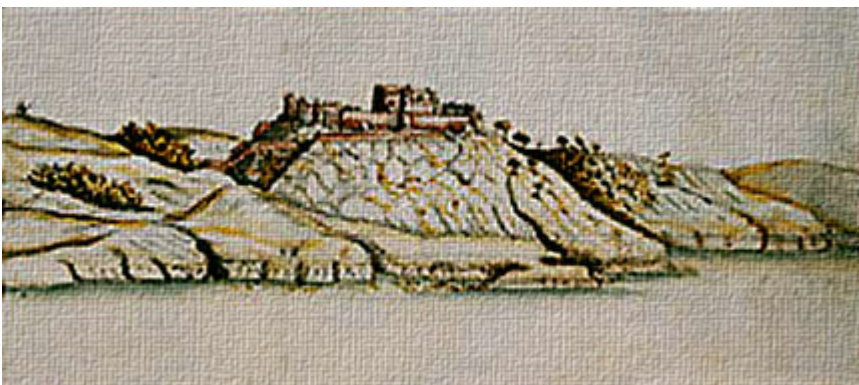
Johann had a good view of the anchorage. He could see seagulls walking on bodies and pecking at them. Not that they had everything to themselves. There was movement in the water around some of the bodies. The Marines had worried about working in the water, but Sergeant Fels had assured them that it was probably just eels, there being no sharks in the Baltic. As the rain clouds moved on he could hear the sounds of ravens moving in. And then there were the flies. He waved his hand to scare away the flies that were buzzing around his face and injuries. The acid smell and taste of gunpowder was struggling to combat that of blood and death.

The Marines were rotating the hard work of hauling in the branches the Danes had laid in the water. Johann was exhausted. This was the first real break he'd had since boarding the *Holmsund* at first light.

Like a good Marine should, the first thing Johann did was set to cleaning his rifle. Not that he'd actually fired it, but with the rain and everything it was best to reload with fresh powder and priming because you never knew when you might need to fight. Then he turned to the second most important thing a Marine could do during any break and dug something to eat out of his pack. Chewing on some sausage and cheese, he pulled out his first aid kit and turned his attention to his various cuts. His legs were a mess. The cut branches—*abatis*, Matthias had called them—in the water had cut deep gouges in his flesh. He waved off the flies that had landed on his legs, tipped a bit of water into his tin cup and added a few drops of bleach to make an antiseptic lotion. Then, gritting his teeth, he sponged his injuries before wrapping the worst of them in bandages.

Hammershus

Holger Rosenkrantz had started out with three militia companies totaling fewer than three hundred men between them—the regular garrison of just over a hundred men under Niels, and Mads Friis' gunners. The Swedes had already landed over two thousand regulars, including about a hundred strangely garbed men with rifles and bayonets. "Have you heard from Sergeant Knud, Niels?"



Captain Niels Gyldenstjerne shook his head. "No, but his platoon and the gunners did get to their fallback position above the quarry. I know they were firing into the Swedes when they stormed Langebjerg."

"That was a good bit of work on Langebjerg."

"Thanks, Holger. It helped that their match was wet and they couldn't use their muskets. That gave us plenty of time to fire or throw everything we had at them and still have a chance to run before they crossed the boundary fence. The slopes were littered with their bodies."

Holger grinned. His wife's kinsman was turning out to be much better than he'd ever expected. Maybe he wasn't a true Gyldenstjerne, but a cuckoo in the nest. That would explain the unexpected competence. "That's good. Come. Now that the rain has cleared and he can see his spotter's signals, Mads will be preparing to fire on the Swedish fleet."

Hammershus, outer courtyard

Mads Friis had served under the master himself, the Swedish chief of artillery General Lennart Torstensson, for over four years. He'd been at the battle to cross the river Lech. He'd seen the newfangled improvements of the up-timers. He'd watched carefully and learned. When Denmark joined the League of Ostend he'd regretfully left Torstensson's service and returned home, bringing with him all his experience, knowledge, and new ideas.

New ideas such as using large percussion caps to fire the cannon, elevation screws to better control elevation of the barrel, and last, but not least, the idea of indirect fire.

Sandvig anchorage, at nearly twenty-eight hundred yards would normally be beyond range of his twelve-pounder cannon. But the Hammershus, at nearly two hundred and fifty feet above sea level, and the several extra degrees of elevation he had added to his cannon meant it was well within range.

He compared the reports from his spotters with his plotting chart and ordered a few final small adjustments. Then he was ready. "Full charge, ball, load guns."

He stood back while his gunners loaded the cannon. Then he signaled his gun sergeant.

Sandvig

The first salvo landed among the lighters servicing the anchored transports. The Marines stopped whatever they were doing to watch. Mild interest turned to horror as they watched waterspouts approach the *Strömsbruk*, then bracket her. This was something they'd heard about in Basic. Area fire. Worse still, it was *observed* area fire. There was nothing they could do but watch while cannon balls dropped out of the sky around the *Strömsbruk*. Not all of them hit, but the men could see the excitement on the deck whenever one did. Then they saw smoke.

"Red-hot shot," Matthias announced.

"Is that bad?" Johann asked.

"Fire on a wooden ship? What do you think?"

The *Strömsbruk* unfurled her sails and slowly start moving. Then men started diving into the water, men who on the whole probably didn't know how to swim. For them to take to the water meant something was badly wrong. Johann crossed himself and prayed for the souls of those aboard.

Langebjerger

Colonel Axel Lillie's sharpshooters were exchanging shots with the Danes above the quarry on the other side of Lake Hammers. He couldn't tell if anybody was being hit, but the Danes were a nuisance.

And, as if the harassment wasn't bad enough, he took another look at the report sent by Sea Captain Arvi Creutz, the naval commander attached to this operation. "Arvi reports that the *Strömsbruk* and all the stores aboard her were lost when hits from Danish cannon caused fires." He passed the report over to his second in command.

Erik skimmed the report and passed it back. "Red-hot shot apparently. But how? You can't see the Hammershus from the anchorage.

Axel looked to the south-west. Somewhere in that direction was the Hammershus. "No doubt we'll find out when we take the Hammershus. Meanwhile, let's just remember they can." He turned his telescope back onto the Danes across the lake. "Send an order to Captain Finck. Tell him I want his men to clear the Danes out of those hills."

Hammeren Hills

"Shit!" Johann backed up and tried to unhook the heather caught in his webbing.

"Here, let me," Matthias offered.

"It's a bloody good thing we aren't carrying our packs or we'd never get through this stuff."

"Which is why the sergeant told us to leave our packs behind and only carry what we absolutely had to."

Johann patted a hand against one of the pouches on his webbing. It contained the few valuables he'd found amongst the dead he'd helped remove from the water. There was no way he'd been going to leave that behind.

They reached the edge of the heather and he peeked out. The Danes were about a hundred yards further up the hill and were busy firing on the Swedes on Langebjerg. The Marines were on their left flank, which meant the cannon couldn't be easily turned upon them. Johann pointed toward the Danes. "You take the one by the left wheel, the closest cannon. I'll go for the one on his right."

Matthias and Johann took aim at their targets and waited for the signal to open fire.

Sergeant Fels fired first. There was a momentary lull before the rest of the Marines fired. That was just enough time for some of the Danes to drop to the ground.

Johann jumped to his feet and joined the other Marines charging up the hill, yelling and screaming all the way. After what seemed a lifetime he topped the rise.

"Where the fuck are they?"

"Over there!" Matthias pointed.

Johann could see men running away. He aimed his rifle and cocked the action.

Click.

"Shit, the bastards are getting away." In the heat of the moment he'd had forgotten his rifle needed to be reloaded. He felt in his pouch for a fresh cartridge. The Danes would escape this time, but next time, he'd be ready.

His rifle reloaded Johann looked around for his fellows. He could see dead and wounded Marines being tended to by the medics down the hill they'd just charged up. He left them to their grisly task and looked around for Matthias. He discovered his friend near the edge of the cliff.

"How are you, Matthias?"

"Knackered. Yourself? How's the leg?"

Until now Johann hadn't noticed anything, but the knee was starting to throb. "Starting to hurt a bit now." He looked around. "What happened to the cannon that were up here?"

Matthias pointed down toward the lake. "Down there. They pushed them over the edge before they ran."

"Well, at least that's two cannon that won't be shooting at us. Where to now, do you know?"

"All right, men. Fall in. We haven't finished our job yet. There's another third of these hills we have to clear," Captain Finck called.

Johann swore. He could have done without Captain Finck's little reminder.

1600 hrs, Hammersholm

Colonel Lillie's new headquarters were located in a farmhouse about half a mile north-east of the Hammershus. The farmhouse had been evacuated in good order, as if the owner just expected to be away for a few hours before returning.

Axel stared at the line of trees that blocked off any view of the Hammershus. He wouldn't be surprised if some ancestor of the owner hadn't deliberately planted the trees to block the sight of the seat of power on the island. Right now he hoped they meant he was safe from the Hammershus' guns. His thoughts were interrupted by Sergeant Rambo.

"The lieutenant is back, Colonel."

"Send him in."

"Captain Finck reports the Hammeren clear, Axel," Lieutenant Wachtmeister said.

"About time. Now we can finally move on the Hammershus, although without the siege cannon there isn't a lot we can do."

"Captain Arvi insists he can't risk offloading them until dark."

Axel snorted. "Handling siege cannon at night . . . that'll be a sight to see. If we could see, that is. Tell Arvi I want him to bombard the Hammershus from the sea"

Erik shook his head. "He won't do it, Axel. Not while those cannon can fire on him. Losing the *Strömsbruk* was bad enough, there's no way he'll risk his precious frigates."

"Damn. Without cannon the only way to take the Hammershus is with a frontal assault, and I'm not prepared to take the casualties that would involve. We'll wait for the cannon to be landed."

"The Danes aren't going to just sit around waiting politely for use to bring up the cannon, Axel."

"I know, Erik. The Bornholm militia companies could arrive at any time. We'll have to split our force. I want a battalion to hold the Danes in the Hammershus while the rest block the approach roads."

1700 hrs, the road to Olsker

Johann pushed the shoulder straps of his pack a little farther apart, searching for an area of shoulder that wasn't hurting from the strain of carrying his still very wet, weighs-a-ton, pack. His feet hurt, and his knee was killing him. He looked enviously toward the coast where a line of Swedes were marching on the flat country of the coast road. The Marines were on the Olsker road, and it was anything but flat. He leaned farther forward as the track steepened.

* * *

Dr. Nicolai Koefoed, a retired university teacher and noted historian, had reported late last year that King Gustav had promised estates in Bornholm to the betrothed of Hans Richter, the dead German hero of the battle for Wismar. The islanders had spent the long winter nights discussing what it could mean. Obviously, the Swedish king intended trying to take the island. If there had been even the slightest chance that a Swedish Bornholm would subjugate directly to the king of Sweden, with no lord between, then the islanders would have gladly left the pig Rosenkrantz to his fate. However, by naming the woman Baroness of Bornholm, Gustavus Adolphus had tipped the balance the other way. The islanders had decided that they had to fight the Swedes if they attacked.

At nearly sixty-five years of age Laurids Andersen was a bit old to be chasing around with the militia, but he was still one of the best shots on Bornholm. He could still do his bit to defend his home.

He watched the men in the strange garb slowly walking up the track toward his hide. He tried to pick out the man in charge, but there was little to differentiate them. And then he saw it, a flash of white on an arm. He selected his target and waited for the man to move closer. His range marker was a fence post precisely two hundred eight paces from his hide. He knew because he'd paced out the distance. The man with the white armband was getting closer to the fence post. Laurids cocked the hammer and took up the first pressure on the trigger.

* * *

Hans Fleischer crumpled and fell to the ground. The rest of the Marines dropped to the ground immediately, rifles pointing in the direction of the gunshot.

Johann crawled over to Hans. He placed a finger across his carotid artery, searching for a pulse. Nothing.

Stephan Böhm, a company medic, crawled up alongside. "Is Hans all right?"

Johann shook his head.

"Why'd they shoot Hans? Couldn't they see his red cross armband?"

Johann looked at the white armband with the red cross on Stephan's uniform. The white on the camouflage pattern Marine uniform stood out. It was just about the only thing about the medics' uniforms that did. "Get that band off, Böhm. It marks you as someone different."

Stephan was outraged. "I can't do that. The armband marks me as a non-combatant."

"Does whoever shot Hans know that?"

Stephan looked down at Hans, then back at Johann. "Are you saying they shot Hans because of his armband?"

"It's possible."

Stephan swallowed, hastily ripped off his armband and shoved it into his thigh pocket.

Together they dragged Hans' body back to where Sergeant Fels was waiting for them.

* * *

"Böhm, what the hell happened to your armband?" Sergeant Fels demanded.

"Private Fabricius told me to take it off, Sergeant."

"Since when have you started taking orders from Private Fabricius?"

"He said the armband might be why the sniper shot Hans."

Sergeant Fels looked from Böhm's bare sleeve to Hans' well-marked sleeve. "Medics, get those arm bands off. Now!"

Sergeant Fels waited until he could see the medics were obeying his order before turning his attention to his new problem. "Corporal Müller, take your fire team and go to the right. Fabricius, Delp, Dinckeler, Kierstead, follow me. We're going sniper hunting."

* * *

Anders Lauridsen watched the Swedes spread out. It was a pity the gunsmoke had revealed his position. It was also a pity he didn't have an up-timer repeating rifle. He could easily have dropped a dozen more of these invaders. As it was, all he had was his old snap-lock rifle, and currently it needed to be reloaded. He did that before setting off to warn the people of Olsker that the Swedes were coming.

* * *

Johann cautiously popped a head over the top of the hill. There was nobody there. He crawled over the

top of the hill before rolling around so he could sit up. About a half a mile away to the south he could see a village. The ground between was farm land with open fields. To the west the ground fell away gently until it met another hill. To the east, at the foot of the hill, there was a small hamlet on the Olsker road, and then there was nothing but fields all the way to the coast, about a mile away.



Matthias sat beside him. "That's Olsker to the south. Beyond the village there's the round church. It dates back to when the Knight Templars ruled the island. I remember thinking it was a castle when I first saw it."

"Why? I mean, why did you think a church was a castle?" Johann asked.

"Well, it's round, like a tower, with lots of firing slits in the walls, and the walls are six feet thick. It certainly didn't look like any church I'd ever seen before. There are four of these round churches on Bornholm. The best is at Østerlars."

"Are they defensive positions?" Johann asked.

"The Templars built them and they have firing slits. What do you think?"

"They're defensive positions." Johann scowled. "I'm not looking forward to trying to wrinkle defenders out of something like that. Not without heavy cannon."

"What! You're not thinking of destroying the round churches of Bornholm? We can't do that. They're unique."

"If the Danes fight from them, there's not going to be a lot of choice."

Matthias shook his head in disbelief. "Sacrilege."

1900 hrs Olsker

Olsker was a small village of barely two dozen structures grouped around the main north-south "road."

All were stone structures, with grass growing on the turfed roofs. The low eaves and narrow streets provided plenty of cover.

Johann and Matthias were walking point, the rest of the company following behind. Dashing from scrap of cover to scrap of cover, the pair made their way through Olsker. Finally they made the southern edge of the village. Johann poked his head slowly around the last house. For a moment he froze, and then he jumped back. "Shit. Danes, about a hundred yards away, and heading this way."

"How many?" Matthias asked?

Johann poked his head around the corner again. There were lots of them, well over a hundred. He pulled back. "About a hundred and fifty. Muskets and pikes."

He signaled that he had located enemy to Captain Finck.

Captain Finck joined Johann and Matthias at the edge of the village. He peeked around the corner. Then he turned to face his men. "Fall back by sections. There's more than two hours until dusk. Sergeant Köppe, send a runner to warn the Swedes. We'll have to hold them here in Olsker.

* * *

Captain Finck deployed most of his force along the southern edge where the road entered Olsker, and where the main thrust of the Danes was expected. Another platoon, including Sergeant Fels' section, was assigned to the western edge of the village.

The houses had few windows, certainly none facing to the west. That left the turfed roofs as the only cover with a good field of fire. Johann and Matthias crawled up to the ridge line of one house and looked over the top. The Danes were coming, and coming fast. Johann took aim and fired. Immediately he rolled behind the ridge line and started reloading. All around him he could hear the sounds of rifle and musket fire.

He crawled back to the ridge line to see the Danes getting close. He tried to follow a running figure, taking up the pressure on the trigger. Then a bullet hit the turf just under his nose and he flinched, discharging his rifle. The Danes were running straight for him. If he could get up on the roof, so could they.

He slid back behind the ridge line and hastily dropped in powder and a new bullet. There wasn't time to ram it home. "You ready, Matthias?" he asked as he primed the pan and cocked the hammer.

"So this is it, then?"

Johan nodded. Their chances of surviving the coming battle were low.

Matthias turned away and threw up. Johann would have, but his gut was already empty.

They knelt just behind the ridge, ready to repel the first men up the roof.

* * *

Four men were heading for their roof. Johann and Matthias shot at them before starting down the turf to repel anybody trying to climb up.

Johann cursed. They had swords and pikes. In the hands of a competent soldier either was more

dangerous than a bayonet on a rifle. He had to get to them before they were ready.

He lunged at the first man to gain the roof, but the man twisted and jumped down. Then Johann felt something slam into his injured knee. It buckled and he fell. On the way down his head hit the timbers of the eaves that held the turf in place. He was unconscious before he hit the rocky ground below.

Three days later, Olsker

Johann gradually came to. He was in a bed. Where he didn't know. He heard a sound to his right and tried to turn his head, but the pain made him cry out.

"Back with the living are we, Private Fabricius?"

Johann recognized Stephan Böhm. He could see he was wearing his red-cross armband again. "How badly am I injured?"

"Your helmet saved you from cracking your skull open like an egg. You broke a bone in your left arm, dislocated the left shoulder, and you've got extensive bruising from where you hit the ground. The local bone setter reduced the break and put your shoulder back, and the local medicine man says regular application of his special liniment should help with the bruising."

"Medicine man? You didn't let a *doctor* work on me?"

"Of course not. I didn't let one of those butchers near any of my patients. The man's the local farrier. He's got quite a good reputation for healing horses. Anyway, you should be back up on your feet in another couple of days. Unless your head isn't as hard as I think it is."

Johann relaxed. Horse doctors knew how to get results. Then he started thinking of the others. "Did Matthias make it?"

Stephan shook his head. "He caught a pike in the gut."

Johann choked. That was a lousy way to go. "He joined the Marines in some misguided burst of patriotism, you know. Silly bugger. He should have stuck with university. Did we win?"

"Yes . . . and no."

"What do you mean 'yes and no'?"

"Well, when he realized there was no chance of getting away Captain Finck appealed for quarter. It was a close run thing. If we'd been Swedes, I don't know what would have happened. Anyway, they gave quarter. So we lost."

"So we're prisoners?"

Stephan shook his head. "No. Because, you see, the war was already over before we invaded, so really we won."

"You mean Matthias didn't have to die?"

Stephan shook his head. "Neither did Hans. And Bornholm is still Danish."

"What?" Johann shot up in his bed. Then the pain hit him, and he fell back.

"It's the peace settlement. As I understand it, in return for Denmark joining a new Union of Kalmar as the junior partner, the Danes get to keep everything they had when they entered the war."

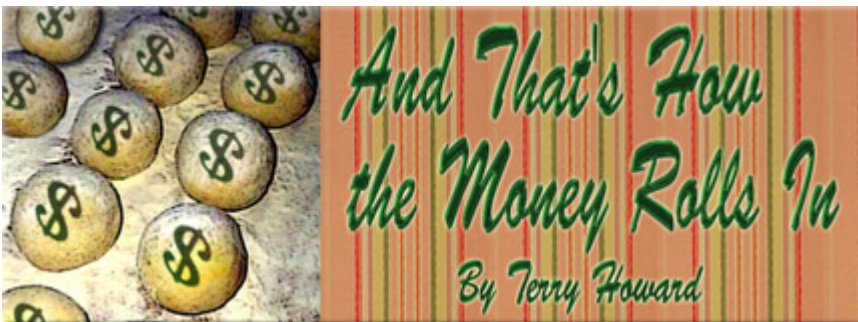
"If they were going to let the Danes keep Bornholm anyway, why did we invade?"

Stephan shrugged. "I think whoever ordered the invasion thought King Gustav wanted the island. After all, he *is* supposed to have talked of making Sharon Nichols baroness of Bornholm."

"Fuck the bloody baroness of Bornholm."

And That's How the Money Rolls In

Written by Terry Howard



Hours later, after the poker game broke up, Janos was still waiting in the kitchen. Arch Pennock thought he'd gone on home after all the dumplings had been finished by the ravening horde that was his poker buddies.

"Mister Pennock," Janos said, "I don't mind cooking Sundays, I really don't. But going into catering, well, I do not know if it is a good idea. When would I do it? I've got a job." He'd been having second thoughts . . . lots of second thoughts.

"John Ose, how much is that skinflint paying you to pluck chickens?"

"I am well paid, Mister Pennock. I make two hundred dollars a week."

"Kid, if you were working forty hours that would be five dollars an hour. But I know better. You're putting in ten and twelve hour days. You give your boss a weeks' notice tomorrow."

"Beg pardon, Mister Pennock . . . what means 'give notice'?"

"Tell him you're quitting and he's got one week to find and train your replacement."

"I can't do that! I need a job to pay my rent. And eat. Besides, if I tell him that, he'll fire me on the spot."

"Good. Listen, you're getting half the profits. We'll put you on a two fifty a week draw."

Janos was a bit confused. Mr. Pennock often had that effect on him. "Two fifty a week draw?"



"It means that each and every week you collect two hundred and fifty dollars starting next week . . . or this week if the skunk gives you the boot. We deduct it from your half of the profits and if there aren't any profits, I'll eat it."

Janos wasn't sure he understood every thing Arch was saying. "You will pay me two hundred and fifty dollars a week to make dumplings?"

"Well, if you want to put it that way, yes."

"Mister Pennock, I will start tomorrow!"

"No, you will start next week. You will give your current employer a weeks' notice. Of course, you don't have to be overly polite about it and if the idiot cans you, then the draw starts this week. And another thing, how old are you?"

"I am twenty-three years of age, Mister Pennock."

"Well, kid, you're way too old to be calling me mister all the time, especially if we're going to be partners. Call me Arch." Arch stuck out his hand, thinking everything was settled and Janos understood and agreed to what was going on. He was soon to find out different.

* * *

Monday morning, not long after dawn, Arch stumbled to the kitchen door in his robe and slippers, rubbing the sleep out of his eyes. The knocking on the door was reasonably polite and entirely insistent.

"Good morning, Arch. I gave notice like you told me and now I am no longer employed as a chicken-plucker."

Arch looked at the horizon. About half of the sun was showing over the hill top. He closed his eyes and rubbed them hard. "Come on in, John. Have you had breakfast?"

"Yes. I ate a heel of bread while I walked to work this morning."

"Well. I haven't had my coffee yet. Do you know how to make coffee?"

"Yes."

"Well, I'm going to take a shower and shave. Why don't you make us some coffee and maybe some breakfast.? Then when I'm awake we'll figure out what we're going to do."

When Arch was finally awake and dressed for the day and back in the kitchen, wondering just what he'd gotten himself into, he found Janos patiently stirring a pan of grits. As soon as Janos noticed Arch he pushed the lever and dropped the sliced bread into the toaster. The electric knife and the cutting frame were back on the shelf and the half-loaf of bread was back in the refrigerator. Grits and toast was not what Arch had in mind for breakfast, unless he added a couple of eggs and some bacon. But the grits were in a bowl and on the table before he could say a word and the young man was hovering over the toaster waiting for the toast to pop up.

Arch sat down and picked up the cup of coffee.

"Mister Pennock, we will need to go to the store to buy what we need to make dumplings."

"Not today, John. We don't have any orders to fill."

"But you are paying me to make dumplings."

Arch could hear the worry in the young man's voice. He had just quit his job. What if Arch backed out on the promised two fifty a week? What if he had misunderstood?

"John, slow down and take it easy. Don't get your dander up. If it will make you feel better, I can give you the first weeks draw today. But we can't be making dumplings unless we can sell them. I've got to figure out how to get the orders coming in. If I know the guys from poker last night, they're busy telling everyone just how good your dumplings are, and how you are willing to make them to order, but it will a few days before we've got any business."

"I can sell them down at the market," Janos said, putting the toast on a plate and setting it on the table.

"Grab me the butter out of the 'frig, will ya? You think you can sell the dumplings down at the market?"

"Sure. If I take a pot down there around noon and give a free bowl to Greta, she will tell everyone. And then everyone who works there will be coming to buy." Janos caught himself and pointed out the short fall. "As long as I am not charging too much."

"Humm," Arch said. "Sounds like a good advertising scheme to me." He pulled his wallet out and handed Janos some money, thanking his lucky stars that he had his retirement funds deposited in the local bank. "You go buy what you need. I'll see what I can do in the way of a push cart."

The money was barely in the boy's hands before he was heading for the door. "John, make sure you get a receipt," Arch called. "This is a business now, so we've got to keep track of expenses."

"I will get a receipt, Mister Pennock," Janos called over his shoulder as the door closed.



Arch wandered out to the garage where his new car and his 1932 model Ford Roadster were up on blocks to keep the tires from going flat and rotting where they touched the ground while he waited for the oil industry to get up and running so people could put their cars back on the road. He looked around and started talking out loud to himself. Years ago he'd realized it helped him think things through.

"The wheel barrow can hold the pot and if I line it with a sheet or a table cloth it can hold bowls and spoons, too. But, it could tip too easily and there would be no way to keep it warm. I could put a tub of hot water in the wheel barrow to keep the pot warm but then there wouldn't be room to hold the bowls. And it could still dump too easily. Naw, what I need is a two-wheeled cart, like the one Dave built for his niece for that flower show. Now, there's an idea."

He looked at his watch. It was still shy of eight o'clock. If he wanted to catch Dave, he'd better call right away.

* * *

Janos left the house in time to get set up at the farmer's market by noon. Arch figured that they'd give most of the dumplings away the first day, just to get demand up. If they could get demand up, that is.

"Let them know you'll be back tomorrow. And when the pot gets cold come on back to the house," Arch called when Janos left with the loaded cart. The five-gallon canning pot, which was sitting in a tub of hot water, held about four gallons of dumplings.

At two o'clock Janos was back.

"Did the pot go cold that quickly?" Arch asked. He was gearing up to ream the lad out for not staying until the pot was cold. They had to stay the course if they were going to make a go of pushcart vending.

"The pot is empty, Mister Pennock."

"You gave away four gallons in two hours?"

"No, Mister Pennock. I gave away maybe one gallon. Then I was too busy selling dumplings to give any more away. I had to take the pot out to use the warm water to wash bowls and spoons. Greta sold me soap cheap since I gave her a bowl and I rinsed the bowls in the public water spigot."

Arch could feel his jaw about to hit the ground in surprise.

Janos continued, "I stopped at the store on the way home for what I couldn't get at the market. Please, Mister Pennock, give me a hand carrying things in. I have to have five gallons of dumplings back down to the market by the time it closes. What do you have to hold a gallon of dumplings in, so people can take them home?"

"You've got an order for five gallons?"

"No, I have five orders for a gallon each. And, please, we must hurry and you must help if we are to get done in time."

"Uh, John, how much are you getting for a gallon?"

"Well, you bet George three gallons for a hundred dollars. You paid twenty dollars for me to make it, so you had eighty dollars profit on the pot. I can make four gallons for twenty dollars so if we get twenty-five a gallon, you will have eighty dollars profit per pot. But twenty-five was high and they bargained me down to twenty. I hope that is enough, Mister Pennock."

"Let's get you into the kitchen and get started. What do you need me to do?"

* * *

When the three different meats were browned and the vegetables were boiling to make the stock, Janos was ready to start on the dough. "Mister Pennock, what are we putting them in to send them home with the customers?"



"If you don't need me, John, I'll run down to the tinker's shop and pick up five beer cans." Down-timers were used to buying milk or beer, tapped from a keg, into their own bucket. So even when the glass industry was turning out cork-able pint, quart, half gallon and gallon bottles, the tinker was still making and selling gallon cans which were often mistaken, at first glance, for paint cans by up-timers.

"But they cost a lot of money."

"John, at twenty a gallon we can afford it. Besides, you tell the customers to bring them back and, if we have to, we can think about charging a deposit later." The idea of getting twenty dollars a gallon for fast food seemed outrageous to Arch until he figured out how many bowls were in a gallon and what the per bowl cost was. Then it almost seemed reasonable.

Then too, inflation was eating people alive. There was always more demand than there was product and more work than workers. Grantville was still a boom town and if that wasn't a recipe for high prices and inflation then one didn't exist.

Arch stopped on his way out. "John? We need a sign. I'll stop and order one, but what should we call our business?"

Janos grinned. "It's my grandmother's recipe. In my language, grandmother is ' *Nagyanya*. 'And dumpling is' *Nokedlik*."

* * *

By the end of the week Arch had purchased the cart from Dave. The first thing he added was an awning to keep the weather off. Then they added a small propane tank and heating element out of an old water heater to keep the water bath warm. Next Arch added a small pot for hot dogs and a box to keep bread and buns warm. He tracked down the paper maker who was making paper plates for Grantville's Fine Food and put in an order for paper bowls. It was there he heard about someone who was steaming and pressing horn spoons. Someone approached them about selling potato chips in paper bags. The first day they had potato chips someone asked if they would want to sell corn chips.

The next Monday, Janos started selling bottled beer at just above cost to keep his customers happy. And to keep them from buying from the other two food carts that had started selling bratwurst on buns and—incredibly, tacos.

In the middle of the third week Janos asked, "Arch, can you make a second cart? I think I can do even better down at the train station but I hate to give up the business we've got in the market. Adolf, my friend, took my old job plucking chickens. He needs a better job."

When he had the second cart built by a wheelwright, Arch quit worrying about inflation eating up his savings. He knew he wouldn't be forced to make an apartment in the garage and rent out the house just to survive. For a while, they were adding a cart every two or three weeks. After they added the third cart, Janos didn't have time to do anything but cook. Shortly after that, they hired a kitchen helper and Arch was thinking about opening a dumpling restaurant.

The cars came out of the garage to make room to store the push carts out of the snow. That was when Arch knew he was a rich old boy. After all, isn't that the definition of a rich old boy in West Virginia; a man with *two* cars up on blocks in his front yard?

SERIALS:

Butterflies in the Kremlin, Part Seven, The

Bureaucrats are Revolting

Written by Gorg Huff and Paula Goodlett



July 17, 1634

"Oh!" Judy the Younger Wendell heaved a great sigh. "She's beautiful."

The bride was beautiful. Brandy Bates wore a flowing white angora/wool gown with a Chinese silk veil. The veil was attached to a wreath of white roses mixed with baby's breath and myrtle leaves. The leaves were said to bring good luck to the marriage. Brandy carried a bouquet of more white roses, baby's breath, ivy and pale pink carnations.

"She's probably melting in that wool," Vicky Emerson muttered. "God knows, I am."

The Barbie Consortium were bridesmaids at the wedding of the season. Wedding of the year, more like. And in spite of Vicky's every effort, the skirts were long and the dresses modest. Not her favorite look.

"Shh!" Millicent hissed. "She's almost here."

The wedding was being held in the formal garden of the *Residentz*, the home and offices of Vladimir Yaroslav's Russian delegation. Father Kotov had pushed for the wedding to be held at St. Vasili's Russian Orthodox Church, but there were just too many people who needed to be invited. And most of them had shown up.

* * *

"Brandy is just gorgeous," Tate Garrett said, then wiped her eyes.

"The groom isn't bad, either," Kseniya said. Vladimir had suffered the indignity of Grantville's eclectic fashion mix—with Russian tradition thrown in—but somehow, magically, it had all come together in a cohesive whole. He wore a Russian style fur hat and cape and trousers that were so tight they might almost have been hosiery. The ceremony was nice, too . . . if a bit long and convoluted with the greater part of it in Russian. The reception was more interesting.

The wedding cake Tate had worked on decorating for two days stood tall and gleaming in the center of a table, flanked by molded Russian Creams on each side. Every kitchen maid at the *Residentz* had learned to make mints whether she wanted to or not, because there were literally thousands of them. Tate blessed Vladimir several times for choosing an afternoon reception. She might have had a nervous breakdown if she'd had to do a formal dinner for all these dignitaries. Instead, they'd set up an informal buffet. People were circulating freely, murmuring to one another about various things.

Tate began to relax. It was going well.

* * *

"No, it's not that simple," Kseniya Kotova said. "The czar can't make laws, not without the consent of the Assembly of the Land or at least the *Duma*. It's not just that it would be unadvisable; he literally doesn't have the authority to change the law on his own."

"So if he wanted to end serfdom, for instance," Reverend Green asked, "the *Duma* would stop him?"

Kseniya gave him a look then glanced over at Colonel Leontii Shuvalov. She was by now fully aware of the up-timer's attitude toward serfdom but this was not the place. While she was still trying to figure out how to guide the conversation to a safer topic, Colonel Shuvalov spoke up. "It probably wouldn't be the *Duma*, royal council, that stopped him but the Assembly of the Land. The ah, middle class I believe you call it. The great families have never been the ones pushing to limit the rights of departure."

"I would have thought they would want it most."

"Yes, I know you would. You up-timers tend to simplify things." Kseniya was a bit annoyed at Reverend Green. "It isn't a conflict between the evil lords and their suffering serfs. It's K-mart versus the mom-and-pop grocery on the corner. The great families can afford to . . . what is it you call it up-time . . . go head-hunting? Though in the case of serfs it's more back-hunting."

Reverend Green snorted.

"I'm not sure that Prince Sheremetev would agree with you," Colonel Shuvalov said.

"Of course not. He's K-mart." Kseniya regretted saying it as soon as it came out but the truth was she despised Fedor Ivanovich Sheremetev though she had never met him. From all reports he was ill-tempered and not very good at dealing with the bureaus. Still, the news that the Smolensk war would have been a disaster had brought him back into politics. So she explained a bit more. "Russia lacks labor and the weather conditions that make it the next thing to impossible to work the land for half the year don't help. If the serfs were released from the land, the only people in Russia who could afford to hire the labor needed to run a farm would be the great families and the big monasteries."

"Don't forget the new innovations," Colonel Shuvalov pointed out. "While there is truth in what you're saying, there is less of that truth now than there was before the Ring of Fire."

Kseniya hesitated. What she wanted to say was unsafe, more for her family than for her. But spending time in Grantville had made it harder to keep her mouth shut. "It takes time to put those innovations into production, Colonel. Can you afford to lower your—" A quick glance at Reverend Green. "—tenants' rent?"

Colonel Shuvalov grinned at her. It was a surprisingly friendly grin. "Actually, yes. Though I will admit that it's only because Prince Sheremetev has been quite generous with my family." Then the colonel turned back to Reverend Green. "Kseniya's father-in-law and I aren't really in the same boat, not quite. We are both Russian officers. He a captain, I a colonel, but the larger difference is that aside from the lands granted me by the czar, Prince Sheremetev provides additional support. So while my financial boat is hardly a yacht, it is a bit bigger than his and less likely to be swamped by changing economic tides."

"Speaking of the army, how are the negotiations with the PLC going?" Kseniya asked.

"Negotiations?" Reverend Green asked. "What are you negotiating with the Polish Lithuanian Commonwealth?"

Now Colonel Shuvalov did look shocked. "Surely you knew! Poland and Russia are at war! We have been since the Truce of Deulino expired over a year ago. The negotiations are an attempt to prevent the shooting war from resuming." Then he looked back at Kseniya. "Not well, when I left Russia. King Wladyslaw is insisting that he is the rightful czar." He snorted. "And I believe the rightful king of Sweden, as well. Prince Sheremetev is convinced that he, like we, has read the history of the other time Smolensk war. So he knows, probably, that it is unlikely that he can actually gain the throne. But considering the degree to which he trounced us in that other time, he seems to expect to receive the war indemnity without actually having to fight the war."

"How likely is he to trounce you this time if it comes to a shooting war?" Reverend Green wanted to know.

"I wish I knew," the colonel said. "The Patriarch was sure that we would win before Prince Yaroslav sent his letter, and we might have been in a shooting war before now if Sigismund III had died this time around when he did in that other history. But he lasted six months more. Prince Sheremetev was less convinced of our chances in a shooting war and remains so. At the same time, we have learned a lot from the Dacha and the Gun Shop. Even from those silly board games they are playing in the Moscow Kremlin now. Still, it will be better for all if we can reach a negotiated settlement." Which was, Kseniya knew, the Sheremetev party line. None of them had any way of knowing it but just then a young lieutenant named Timrovich was reporting to his general in a place called Rzhev.

* * *

"So how was the wedding, Colonel?" Prince Fedor Ivanovich Sheremetev asked.

"I found it quite interesting, sir." said Colonel Leontii Shuvalov. "Though I will admit I was a bit disappointed to find that the Poles had held a war while I was gone and I wasn't invited."

"Rzhev made things much more difficult," Prince Sheremetev said. "Filaret is back on his invade Poland hobby horse. And without Shein we probably couldn't hold him back. Shein figures we are getting stronger faster so time is on our side for now. But he will switch back as soon as he figures we're ready." Prince Sheremetev shook his head in disgust. "None of them can see that Poland is not the real enemy. The real enemy is Gustav and his new USE. So tell me about the USE, Leontii?"

Leontii made his report. That the USE was rich and powerful and becoming more so every day was beyond question. He had seen several different kinds of airplanes. The largest of which was dwarfed by the Test Bed but the slowest of which made it seem a snail by comparison. Dirigibles were not a viable weapon of war when airplanes flew. But the real danger was the factories which turned out hundreds of items in the time it would take a craftsman to make just one. Yet Russia had factories too. "While we are behind, we aren't that far behind. A year maybe two. I took a steamer from Rybinsk, one of the ones that they were using to resupply Rzhev. I was amazed by the factories along the Volga." He acknowledged the corrupting influence of the up-timers but pointed out that Vladimir and the Dacha were proving incredibly valuable and were probably essential. "I understand that King Wladyslaw and some of the magnates have recruited up-timers of their own. By the way, how are they taking the events at Rzhev?"

"The *Sejm* seems deeply offended at the outcome. More offended than cautioned, unfortunately. It must be our fault and we must have somehow cheated. Made a deal with the devil something, anything, other than that they attacked us and we outfought them. They seem especially offended that we uncultured

eastern barbarians had such things as breach-loading cannon and that the walking forts proved so effective.

"It hasn't made things any easier on the diplomatic front. About the only thing keeping them from a full scale invasion is Gustav on their western border. The Truce of Altmark expires next year and the way that Sweden and the USE have been going, Poland simply can't afford to be involved in a war with us when Gustav gets around to them. What concerns me is I don't see any particular reason for Gustav to stop at the Russian border."

Through the fall and winter of 1634 the *Duma* debated. And talks with the Polish Lithuanian Commonwealth went nowhere. In the winter of 1634 Patriarch Filaret became ill and much of the heart went out of the "invade Poland" faction. Meanwhile more factories came on line. most of them using forced peasant labor. This upset the peasants because winter was their traditional light time. It also upset the Great Families because they couldn't hire the peasants without their landlords' permission.

Since the Ring of Fire, the anti-serfdom movement in Russia had slowly grown from two directions, top down and bottom up. With the service nobility caught in the middle. The top down part was a mix of morality and self interest. It was fairly small because the top of the Russian pyramid was small. There were fourteen to twenty great families depending on how you counted and a similar number of really large monasteries. A few hundred people in the great families and no more than a few thousand in the monasteries.

On the other hand, there were over thirty thousand members of the service, or bureaucratic, nobility—people whose livelihood depended on serf labor. And they were the people holding down the vital mid-level military and civilian posts. They were the tax collectors, the construction supervisors and the managers. In the Russian army they were the captains and the colonels, but rarely the generals. It was the service nobility, bureaucrats and soldiers alike, that had kept Russia from collapsing into chaos during the time of troubles. They had stayed on the job and mostly out of politics, serving whichever czar was in power, and kept the wheels from coming completely off. They were generally non-political, but threatening to take away their serfs would change that in a hurry. As had been shown in 1605, the last year when peasants leaving the land hadn't been forbidden.

Then there were the serfs themselves, the largest proportion of the Russian population. While many, perhaps most, resented their status as serfs, darned few of them objected to the institution. It wasn't that they found the social order objectionable—just their place in it. They ran to the wild east, they ran south to the Cossack lands, they even ran west into Poland, hoping for a better deal. What they didn't do was stand where they were and say "This is wrong!"

It was a subtle but important distinction. There was no Harriet Tubman sneaking back into the Moscow province to smuggle other serfs out to the Cossack territories where they could be free. No Russian Frederick Douglass standing proudly and articulately to decry not just his serfdom but all serfdom. At least, they hadn't done that before the Ring of Fire.

The Ring of Fire changed all that, though it took a while for the change to take root. It took a while . . . but not that long a while. Rumors fly on the wings of eagles, they say. They fly even faster on wings made of mimeographed paper, and the more radically inclined of the boyar class could afford lots of paper. Russia might not have had its own Frederick Douglass, at least at first. But the writings of the original made their way into Russia and into Russian, along with *Uncle Tom's Cabin* and other such works. And they resonated. Resonated like jungle drums, like liberty bells. Soon enough, there were Russian serfs putting those thoughts in their own words. By 1635 Russia was starting to look like a powder keg.

But only starting to. And if it was a powder keg, it was milled powder not corned powder. And a poor mix at that.

No one wanted a return to the Time of Troubles. No one wanted Polish troops flooding into Moscow again. Then there was Rzhev. In military terms, Rzhev wasn't very significant at all. But in emotional terms it was. In Rzhev Russia defeated the Poles. And the army that did it had a good number of serfs in it, with a lot of them involved in the fighting. In Rzhev, the Russians showed themselves to be technologically superior to the Poles. Rzhev brought a new feeling of confidence to Russia, and a great deal of political capital to the czar.

Patriarch Filaret wanted to spend that capital invading Poland and retaking Smolensk. But Czar Mikhail Fedorovich had a different idea. He lit a match. . .

* * *



In an unprecedented move, today Czar Mikhail decreed that "Forbidden Years" are now limited, with some qualifications. Anyone who wants to buy out and leave his current lord may do so, provided he is willing to move to Siberia and look for gold or other metals and resources that are now known to exist.

Treasure Maps For Sale Here! Up-time sources used! Mine for GOLD, SILVER, COPPER! Find OIL!

Fedor shoved the paper at Igor. "And what are we going to use for labor now, Igor? The czar has betrayed us!"

"Shhh!" Igor hissed. "You want to get us killed!"

"I'm as loyal as any man," Fedor insisted, though more quietly. "But that doesn't get the crops in. Without our serfs my family will starve . . . and so will yours."

Which, Igor thought, was overstating the case, probably. It was true that members of the "service nobility" like himself and Fedor needed their serfs. There was never enough labor. "They claim that the new machines will take care of the labor problem," Igor said, still trying to calm his friend.

"They claim! If we could get them. You know how long the waiting list is and you know the boyars will all have them before we even see one. Which is probably a good thing, because who knows if they will work?"

Igor considered bringing up the increase in pay, but he was very much afraid that Fedor would start yelling again. Fedor had already made his opinions on the new paper money quite clear, many times. And honestly, Igor tended to agree with him. How could a piece of paper with printing on it have value? It just didn't make sense. Whenever he could Igor spent the paper as quickly as he could and saved the silver. He wasn't the only one. By this time a silver ruble—which nominally had the same value as a paper ruble—was buying three times as much. It didn't occur to Igor that the new paper rubles were worth three-quarters as much as the silver rubles had been before the paper rubles were introduced. Silver rubles were disappearing into holes and hidden compartments all over Russia, in a classic example of Gresham's Law.

Igor and Fedor had recently been transferred to Moscow to appointments within the Bureau of Roads, because the Bureau of Roads was expanding with the introduction of the Dacha Scrapers. They had both gotten raises but those raises hadn't been in the form of more lands as had been usual. The raise had been more of the new paper money. They didn't see Pavel Borisovich sitting in the next cubical with a friend.

* * *

"Papa, have you heard about the new proclamation?" Pavel asked Boris. "I was having lunch with Peter Ivanovich over at the Bureau of Roads and a couple of the new hires were talking. They seemed pretty upset."

"Yes. I imagine they were."

"How bad is it?" Pavel asked.

"It probably won't be too bad for us. We have new plows, a seeder, a reaper and a thresher. But it will ruin a lot of the lower nobility. How many are ruined depends on how many of the serfs can buy out and how many decide now is a good time to run." Serfs running away had been a major problem for years. Often aided and abetted by the upper boyars and the church, who always needed more labor.

Whatever Gustav Adolph thought, Americans didn't have a lock on bureaucracy. Russia had had a well-developed bureaucracy for many years. What Russia hadn't had when it was developing that bureaucracy, was the money to pay the bureaucrats. So whether it was a clerk in Novgorod, a manager in the Bureau of Roads, the *Konyushenny Prikaz*, or a cavalry trooper, most of the pay for his service was in the form of land granted on a semi-permanent basis by the czar.

Even at this late date the knots of law and custom that turned a free man into a serf weren't quite absolute. If you could escape and stay gone for five years, you were free. And the government wouldn't hunt you; that was up to the person that held the land you were tied to. Also, in theory, there were times when you could buy your way out of your chains. In theory. The last thirty or so years had been "Forbidden Years." Years during which even if you could come up with the cash you weren't allowed to change your status.

Boris continued. "Politically, it's hard to say. The czar may gain enough from the high families and with the general population to offset what he's going to lose with the *dvoryane* and *deti boyars*." Czar Mikhail had been, at least on the surface, quite clever in how he had implemented the new "Limited Year," but Boris wasn't at all sure he had been clever enough.

* * *

"It's a big step forward," Bernie Zeppi said. "A really big step."

"It's a disaster," Filip Pavlovich, Bernie's sometime tutor said. "Labor, Bernie. There's not enough. There's never been enough."

"Freedom, Filip." Bernie said back. "Why don't people get that people will work harder and produce more if they're doing it for themselves?"

"Because it isn't true," Filip told him bluntly. "Oh. People probably will work harder if they're paid. But not enough harder to make up for the cost of paying them."

Natasha felt like burying her head in her hands. Or possibly screaming at the top of her lungs. Instead, she took a deep breath, and said, "Gentlemen, this isn't a productive conversation. Can we get back on topic, please?"

"It will make Czar Mikhail even more popular than the win at Rzhev," Anya pointed out.

Bernie grinned his sloppy grin at the girl who'd apparently captured his heart. Anya's presence at the meeting—or, rather, her speaking in the meeting—was an indication of just how much Bernie's presence had affected the Dacha. Bernie was blind to class and it was rubbing off. Anya had started off as a cook's assistant and with help from Bernie had become the Dacha's household accountant. In the process she had become involved in the development of the EMCM, Electro-Mechanical Calculating Machine.

Natasha didn't really understand why or how the little tart had done it, but Bernie admitted to a "fondness for the underdog." Natasha would just as soon have sent the baggage packing. There was something wrong about Anya. Natasha just couldn't put her finger on what. Still . . . a happy Bernie was a productive Bernie, so she put up with Anya. Besides the girl did the work, as much as Natasha hated to admit it.

"Popular with who?" Filip asked. "Serfs don't have weapons. The service nobility does. And so does the strelzi. And it's they who will be most affected. When your Czar Lincoln talked about limiting slavery, not abolishing it, it caused a revolution and that was in a country where only a third of it had slavery in the first place. In Russia, serfs are everywhere." Then apparently remembering who he was talking to. "I'm not saying serfdom is a good thing, Bernie. But it's too soon to do this."

"More money for Vlad," Bernie said. "Reapers and threshers are going like hotcakes. What's weird to me is that you—" He pointed at Natasha. "—aren't freaking out about losing serfs. You've got all these lands to take care of."

"I," Natasha said, "can afford to hire help. And people want to work for us, because we can afford to take a smaller cut because we have more people. Most of the truly wealthy are the same way, you know. As is the church. We can make a deal, attract more of the labor force. It's the, lesser nobility, people like Boris and Filip, who need the serfs tied to the land. That's what concerns Patriarch Filaret. Ill as he is, he counseled the czar against this move. And Czarina Evdokia is very, very worried. But the boyars and *Duma* men are all for it. It will make it much easier for us to poach serfs from the lower nobility. There's a lot of nervousness in Moscow right now."

"And it won't take much to start a firestorm," Filip said. "It's not like we haven't had them before. Or

wouldn't have them in the future. Remember Peter the Great. For that matter, remember 1917. That's why I said it's too soon, Bernie. There aren't enough plows and reapers yet to make much of a difference in overall production. And members of the service nobility like me mostly don't have them yet."

Anya sighed. "I understand your point, but already serfs are being put to work in factories. Rented out, or close enough to make no difference, to make their lord extra money. It will never be the right time! Slavery and serfdom don't just fade away. No oppression does. It takes people standing up and saying enough, no more! And making it stick."

Natasha knew that was true. Evdokia had discussed it with Mikhail. Bernie was wrong. It was probably true enough that people worked harder when they were working for themselves. And the evidence was pretty clear that societies without serfs were over all more productive than those with serfs. But that extra productivity didn't go into the pockets of the lord. It went to buy the former serf a new suit of clothes or an extra room of the house, maybe some toys for their kids. Which worked just fine for society as a whole, but sucked so far as the lord was concerned since he now had to pay for labor that he used to get for nothing or at least a lot less.

* * *

Grantville

"What's up, dude?" Brandy asked. Calling Vlad dude in her empty-headed surfer girl voice usually got a laugh and sometimes led to other things.

"Huh? What?"

But not this time apparently. "What's wrong, Vladimir?"

Vald sat down heavily. "I'm worried. There's bad news from Moscow, but I'm not sure how bad it really is. Boris is being reticent. It could just be that he's busy I guess . . . but it could also be that he's distancing himself from the family. Father Gavril showed me some letters from his family which indicate that the *dvoriane* in the military are badly upset with Czar Mikhail and increasingly concerned with foreign influences on him."

* * *

"Ksenyia, could you puh-leeze explain all this to me?" Brandy ruffled her hair, looking like she was about to start tearing it out at the roots. "What's going on in Moscow? Vlad's worried sick about Natasha, and Natasha is worried sick about, well, everything. But at the same time, Natasha says that the income from the lands is fine, higher than ever. And from sales of the farm equipment. That's got to be helping."

Home, Ksenyia thought, was difficult to explain to an up-timer. They were so rich. They just had their brains in the wrong . . . no, that wasn't right . . . they had their brains in a *different* place.

She held back the sigh, then said, "In the last years . . . so many changes. It's hard to adjust to so many changes. You know, my father is *streltzi*, right?"

Brandy nodded.

"*Streltzi* means shooter, like musketeer. Mostly we are city guards, but we also guard caravans and when war comes the *streltzi* are the infantry. But it is usually not war and being the city guards doesn't take up all of our time. So most *streltzi* have another job: merchant, baker, leatherworker or silversmith,

something. My father is . . . like a sergeant major, but my family also owns a tannery. We're *streltzi* , but upper *streltzi* . My father-in-law is *dvoriane*. The *dvoriane* are court nobles and army officers, sometimes bureaucrats, depending on what job is assigned. In fact, my father-in-law is an officer in my father's regiment. But my father-in-law's family is not as wealthy as my family. They receive thirty-five rubles a year and a . . . I don't know a German word that fits *pomestie* . *Pomestie* is land given, or perhaps loaned, to the *dvoriane* as part, usually the larger part, of the payment for their service to the crown. The *dvoriane* get to collect the rent on the *pomestie* . But while my father-in-law receives *pomestie* lands enough to make him richer than my father, he doesn't have enough tenants or serfs for more than half the lands and you can't collect rent from serfs who aren't there because they ran off to work for a monastery or high boyar."

"Why do the serfs do that?" Brandy asked "It seems it would just be trading one master for another. You would think that the small holders would be, ah, the good guys, here. That they would be the allies of other men, those who have even less."

"They can't afford to be," Kseniya insisted. "Remember the expenses. They don't have labor-saving devices. They need the serfs."

"I bet there are a lot more of these small holders than there are high boyars and churchmen, aren't there?" Brandy thanked Kseniya and went off to do some thinking.

She remembered things said about the *dvoriane* in other conversations. And a quote from somewhere: "Never trust a banker." There was more to that quote, but she couldn't remember it. The thing was, the *dvoriane* sort of felt like the bankers from the quote. People who would cover themselves first, last and always. Who wouldn't take sides or would change sides as the wind shifted. Yes, she understood the predicament of the bureau men and soldiers of the service nobility. But that didn't make serfdom right. She also remembered that Boris was *dvoriane*. And that letters written to Natasha went through the Grantville Section.

Brandy realized that Vladimir needed a way to get messages to Natasha that the Grantville Section wouldn't see. *A file baked in a cake*. Brandy giggled. *Everything old is new again*.

* * *

Some months later a serf named Yuri laid a bar of white-hot steel in the slot of a drop forge and waved. Another serf from his village pulled the lever and the hammer came down. The bar weighed fifteen pounds and the hammer, which had to be lifted by means of a crank, weighed over a ton. The force of the blow transmitted through the bar and the tongs hammered his arms. It was hard work. Not the sort of work Yuri enjoyed. It was hot and it was bloody dangerous. It wasn't the sort of job that Yuri would have chosen. But Yuri was a serf. He wasn't given a choice.

It was also, in Yuri's opinion, stupid. There were a lot of things that needed doing in the village before harvest, things that couldn't be done over the winter because the ground was frozen. Instead, he was here making extra money for the lord and he knew darn well that neither he nor anyone in the village would see a kopek's worth of the money. No. The money would go to the lord to pay the village's debt and there would be more fees to make sure that the village never got out of debt. He wasn't going to be able to buy off his ties to the land. Heck, he wasn't even working in his home village. The foundry was fifteen miles away from home and he was being charged rent as well as everything else. There are limits to all things and Yuri had just about reached his.

Since he couldn't hope to buy out, he'd just have to run. He didn't want to, because it would stick the rest of the village with his debt. But he'd had it. Yuri began to plan. He couldn't tell his fellow villagers

what he was planning; they would report him rather than being stuck with his debt. He'd need food, an extra set of clothing, one of those gold mining maps. Not that he particularly wanted to mine gold, but it would give him a direction to run and even a reason for being on the road. Yuri pulled another bar from the fire and continued to plan.

Early Fall, 1635

"We need more reapers," Anya said.

"Well, we don't have them," Natasha told her. "And we aren't going to have them before the harvest is in."

"What about renting yours out after you have your crops in? With the serfs that have headed for the gold fields there are a lot of people, even some of the boyars, who still won't have their crops in by that time. We could probably rent them for near the cost of buying one and still not have enough to supply the demand."

It was a good plan. It probably would have worked except . . .

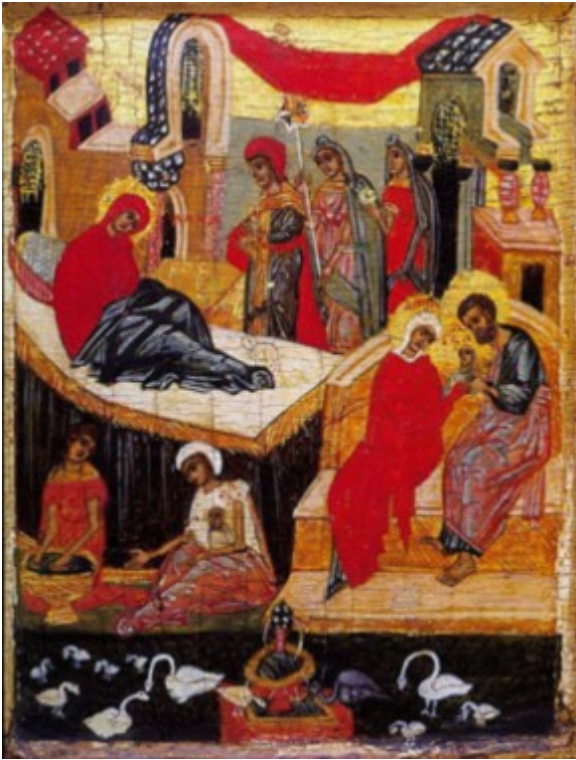
* * *

It was mid-afternoon when Peter Boglonovich plotted his measurements. The thermometer was dropping and the barometer was rising; the winds were from the north west and strong. The front had passed through and was on its way south. And Peter couldn't tell anyone. Peter had an excellent clock and real up-timer made equipment, a small wind-powered generator to power his equipment and provide some creature comforts. What he didn't have was a radio. He had maps—good ones—and he knew how to use them, having been trained at the Dacha. He received weather data to plot on those maps from other stations once a week and sent his data off with the same messenger. The messenger was due in two days and Peter figured that the cold front would be halfway to Moscow by then.

"What's the use of a weather station if it doesn't have a radio?" Peter muttered. He knew the answer. He was up here to provide a plot, a record of weather conditions, that could be used to make the predictions more accurate when they got the radios installed and could do real-time prediction. Establishing a baseline was all well and good, but if Peter's calculations were right, real-time weather prediction was going to come too late. This storm was going to sweep over Muscovy, depositing sleet on fields and those crops that hadn't been harvested were going to get pounded.

Five days later

Ivan looked out at his fields and saw death. Death for crops under a sheet of ice and sleet. Death for his family this winter as they ran out of food. Ivan lived on a farm forty miles northeast of Moscow and the storm still raged, beating down the stalks and turning the ripe grain to mush. He wasn't the only one by any means. The storm ripped through Russia's heart, trashing a full quarter of the expected grain crop for the year and it could have been much worse.



On a farm thirty miles to the east of Ivan's, Misha went to the family altar, knelt down in front of the icons and thanked God and his ancestors that he had spent the money to use the reaper, in spite of his wife's complaint of his spendthrift ways. His crop was in the barn. All of the village crops were in the barn, safe from the storm.

For Misha the storm was good news. Amazingly good news. It meant that the price he could get for his crop would be considerably higher. Even after the taxes and tithes were paid, which would take more than half his crop, he would have grain to sell for the new paper rubles. Perhaps enough to pay off his debt, which would allow him to leave. At least if he promised to go to the gold fields.

Other farms had been missed by the storm or hit only by the edges. Then there were the potato fields. It wasn't just the potatoes from the Ring of Fire. The patriarch and czar had both read the histories and put in a large order for potatoes with English merchants. It had taken a while, but the merchants had delivered. Half a ship load of potatoes had arrived in the spring of 1635. According to the captains, the potatoes were harvested from Chiloe Island in South America. The captains also reported that they weren't the only people sent after them. But they might have just said that because they had only delivered half a ship load when two full ship loads had been ordered.

The peasants who had been assigned to grow them had not been pleased. But with the government promising to buy the potatoes as a fixed price per pound, and threats about what would happen if they failed to follow instructions, they had grown them. The peasants were going to be displeased again. Fixed prices worked both ways.

Still it wasn't enough. Not with the number of peasants who had managed to buy out or simply run off. That move had delayed the harvest in a number of places and that delay had been crucial. It had destroyed millions of rubles worth of crops. The bureaucratic service nobility placed the blame for the disaster at the feet of the czar. And though they were unlikely to actually starve because of it, hundreds, perhaps thousands, of them had been ruined.

* * *

"Natasha, you see Czarina Evdokia often, do you not?" Boris asked.

Natasha, hearing the tone of his voice, took a long look at him. Boris was always a bit pasty-faced, but these days he was dreadfully pale. And had dark circles under his eyes. Which, oddly for the current situation, almost made her laugh. He looked so much like Bernie's cartoon. "Yes, I do, Boris. Why?"

"I'm worried," Boris said. "I know there's something going on. Something bad. But I'm excluded. The word is out that I'm too close to the Dacha to trust." He sighed. "It's to be expected, of course. Nevertheless, I do hear rumors. One is that the *strelzi* are angry, and are making alliances with a number of men in Moscow."

"What do you want me to tell Evdokia?" Natasha asked.

"To be careful. Very careful. Even to get out of Moscow, if they can."

* * *

"Back," Boris hissed. "Get back."

Pavel pulled his head away from the alley's mouth. "We can't go that way, Papa."

"Then we'll turn back and try another. We've got to get home to your mother and get her out of here."

Boris and Pavel rushed home, taking as many back ways as possible. There was danger on the major streets of Moscow, and it wasn't just the burning buildings. Gun shots were frequent.

When they reached the house, Daromila had already packed. An old Moscow hand, she'd smelled the smoke and heard the shots. Fire was never a good thing in wooden Moscow, which had burned and arose from its own ashes numerous times.

"What started it this time?" Daromila asked.

"The new price controls," Boris said. "Too high for too many, or at least that's their claim."

"Where are we going, Papa?"

"You and your mother are going home to the village. On your way, stop by the Dacha and pick up Ivan."

"You think it's that bad?" Daromila asked.

"Yes. This isn't just a riot. This is politics." Boris said.

"I don't understand," Pavel said, somewhat apologetically.

"That's because you don't remember the Time of Troubles," his mother explained. "*Dvorianes* serve Russia and stay out of politics. Especially at times like these."

"But surely not this time. This time the *dvoriane* are involved and the boyar's sons as well. This is about the serfs and the limited year. Our friends and our neighbors are involved. Many of them have lost everything when their serfs ran off looking for gold—"

Suddenly Pavel found himself against the wall with his father's hand around his throat. Pavel was a fairly tall young man, taking more after his mother than his father. He was also fairly quick, but he had been looking right at Papa and hadn't even seen him move.

"Yes!" Boris hissed. "And whoever wins, a lot of them are going to die in the next few days and weeks. The ones who have made too much noise. Someone is giving the *dvoriane* enough rope to hang ourselves. The bureaus are going to be purged. That includes friends of ours, people we have known for years. But it's not going to include your mother or your brothers or you. Not if I can help it. We don't stay out of politics because we don't care, boy. We stay out of politics to stay alive. And I'll tell you something else. Whoever wins, it won't be the serfs and it won't be the *dvoriane*, the boyar's sons or the *streltzi*. It will be a faction of the high families. And any *dvoriane* who gets involved will lose . . . even if they are on the winning side this time."

Pavel looked at his mother but she was looking back at him just as hard-eyed as his father. "You don't remember what it was like when we had three czars in as many weeks, Pavel. But I do and your papa does."

"Now, are you going to do what I tell you to?" Boris asked and Pavel felt his father's fingers tighten around his throat. Pavel nodded.

Then his father released him and went on as though nothing had happened. "On the way, you pick up Ivan. Thank God that two of your brothers are in Germany already. If Natasha asks what's happening, tell her but don't dally to do it. I wouldn't be surprised if the Dacha is targeted in the next few days."

Boris' estimate was off. When Pavel and Daromila passed the Dacha there were troops already there. In fact, there were troops at the Dacha before the riot was well started.

* * *

After seeing his wife and son off, Boris went back to the office. This was a time to be precisely where you were supposed to be and easy to find—so people wouldn't think you were somewhere you weren't supposed to be, doing something you shouldn't.

By the time he got to the office, several of his more experienced people were already there. "Gregory, I need you to sanitize our records."

"You think we're going to get inspected?" Gregory asked, then blushed for such a silly question.

"Of course we will. Every bureau in Russia is going to get inspected after this. Oh . . . and Gregory . . . not too sanitized."

Gregory smiled. It was still a rather nervous smile, but at least it was the smile of a man who knew what he had to do. The way these things went, the inspectors would keep looking until they found something. It was best to leave them something minor to find.

* * *

"I'm sorry," Colonel Shuvalov said politely. "But I have my orders from the *Duma* ."

From the *Duma* , Natasha noted. Not from the czar or from the Assembly of the Land. Just the *Duma* . The troops, she was told, were there for the protection of the Dacha. Natasha also noted that the colonel was a member of the Sheremetev faction at court. Which wasn't good news. The takeover of the Dacha was amazingly anticlimactic, certainly for most of the people living and working there. From the start, the

majority of the workers and researchers had been from the *dvoriane* and the *deti boyars*. Including a couple of, literal, boyar's sons. Oh, there were a few peasants who had, through talent and work, made a place for themselves among the researchers. Anya and a few others. And more *streltzi*, especially where craftsmanship was needed. But the cultural outlook of the Dacha was that of the *dvoriane*: do your job and stay away from politics. At least court politics . . . the bureaus had their own.

Unfortunately, that option wasn't really available to Natasha. What protected her was the value of the Dacha itself. That, and keeping her lip buttoned.

* * *

Anya waited for her meeting with Colonel Shuvalov with some trepidation. He was interviewing the senior staff individually. The danger was that he would be upset that someone of her birth would be among them. And in her case a demotion, deserved or not, could potentially be fatal. Her other employer wouldn't care whose fault it was. But Colonel Shuvalov was friendly, asking her about her work, what they were accomplishing with the EMCM and its use in accounting.

"It uses punched cards for input," Anya explained "Not because we can't make magnetic tape. We can't make magnetic tape that stops and starts without tearing. People type one number at a time and the pauses aren't all the same length. It also lets us print out the figures and the codes before running them through the machine. That let's us catch errors."

"Yes. I understand the exchequer has been asking for one. Or rather, for possession of this one."

"Yes, Colonel. We'll be sending this one to them as soon as the next one is ready."

"I'm sure they will be happy to hear it. Now, though . . . the prince has some instructions for you. A red report, please."

Anya froze. "The prince" was the code name for her employer. That, combined with the phrase "a red report," meant that she was to give Colonel Shuvalov a full report. But the colonel wasn't a spy, not her sort. She couldn't be absolutely sure of course. It was possible that he was simply a better spy than she was . . . but Anya didn't think so. And if the colonel wasn't a spy, he was what he appeared to be: Sheremetev's man. Which meant that Sheremetev was the prince. Anya had never tried to identify the prince. Quite the opposite, in fact. Not knowing who the prince was meant she couldn't tell. Which meant, in turn, that he was much less likely to have her killed. Now she had effectively been told who he was. That didn't bode well for her long term survival.

All that flashed through her mind in seconds and she came back to herself. "The new EMCM will have additional capabilities. An expanded command set. But the real key is less the machine than the input and output devices . . ." She finished a more complete description of what the new EMCM could do that the Dacha staff didn't really want known outside the Dacha. Then she started identifying the other spies that worked in the Dacha.

"Yuri the smith is selling drawings of parts to a man in the Bureau of Mines. Efim is actually employed by Prince Kaminsky, though he doesn't know it. . . ." The list went on. Anya had been working at the Dacha for years and knew, for the most part, who the other spies were. Most of it wasn't new information. She discussed the way information and other things were flowing in and out of the Dacha. She didn't mention Great Aunt Georgia's Special Apple Onion Pecan Cakes. The cakes that had recently started arriving from Princess Brandy's Great Aunt Georgia in Grantville—by way of Brandy. And she didn't mention the little packets hidden within them. She went into the interpersonal relationships of the staff.

Anya wasn't altogether sure why she didn't tell the colonel about Natasha's cakes. It certainly wasn't out of any great love for Natasha. Natasha was what Bernie would call a "California Liberal." Self-righteous in her condescension, the noble Lady Bountiful, stooping to lift up the poor, downtrodden serfs. She was also one of those jealous-but-not-interested women. The ones who don't want a guy for themselves, but don't want anyone else to have him either. Not mentioning the cakes was a risky move, even though Anya thought she was the only one who knew about the little packages.

* * *

For several weeks things went along pretty much as they had before. The Dacha's contacts with the outside world were a bit more limited than they had been. They had always been limited; now they were the next best thing to nonexistent. Even contact with associated projects like the *Czarina Evdokia*, the large dirigible being built in Bor just across the Volga from Novgorod, or the foundry and gun shop located in Podol just a few miles away from the Dacha, were difficult and sporadic.

* * *

"I'd kind of like to know what Cass is up to," Bernie said. "He's not a great friend or anything, but I'd still like to know. And do we know anything about that nurse and her family who came to Moscow?"

"Nothing, Bernie. Not yet, anyway."

Bernie thought Natasha was pale enough that she wouldn't need that god-awful makeup women wore in Russia. "That Shuvalov dude seems like a pretty good guy. Do you think he'd let me send a message?"

He hadn't thought it was possible, but Natasha went even whiter.

"Don't try it right now, Bernie," she said. "Just leave it for a bit."

"You gonna tell me what's wrong, Natasha? I know there's something I'm missing here. Besides the armed soldiers, of course. And not seeing Boris for weeks. And the fact that everyone is tiptoeing around like ghosts."

Bernie was not going to understand this. Natasha knew that down to her toes. "Colonel Shuvalov is a *deti boyar*, a retainer of the Sheremetev family, Bernie. Rather like Nikita Ivanovich Slavenitsky is to my family."

"Yeah. He's pretty polite. Nice guy," Bernie said. Not getting what she was saying at all.

"He goes out of his way to be cordial," Natasha admitted. "But stop and think, Bernie. Colonel Shuvalov doesn't push it, as you would say. But . . . he's here for more than one purpose. My family, the Yaroslav family, were once independent princes. We retain the titles and are very wealthy. We're just not as politically well-connected as some of the other great families. At least we hadn't been. With the Dacha we were starting to become so. So Colonel Shuvalov has been selected . . ."

"He's after you?"

"Shh, shh. Not so loud, you idiot!"

"That's fucking slavery . . . or something. Like something out of a goddamn book! One of my sister's stupid romance novels."

Natasha laughed bitterly. "Romance has very little to do with it. Through me, my family and its fortune

will serve Shuvalov's ambitions. Our . . . sons . . . will be boyars, great family boyars."

"That stinks!"

"Keep quiet, Bernie. Stop shouting," Natasha hissed. "As long as we're quiet and don't make a fuss, Colonel Shuvalov will remain polite. He would much prefer to have a . . . mutually supportive relationship. But the relationship itself is in no way optional."

Not on her part and not really on his. The basic motivation behind the match was to move Natasha's family's wealth into the Sheremetev family's control. They weren't going to take the wealth away—just control of it. This was necessary, since while the Yaroslav's weren't really one of the great families—they were one of the twenty but not one of the fourteen—they had acquired a degree of wealth and a set of connections that made the family potentially disruptive if not brought to heel. Reined in, as it were.

"It could be a lot worse, Bernie," Natasha pointed out. "Colonel Shuvalov is bright, charming, and a decent sort. He's not . . . one of the worst. Not old. Not gross. More modern than some."

Bernie thought for a while. Shuvalov was also, unfortunately, as Bernie already knew, completely loyal to his patron. He was aware of Sheremetev's ambitions but didn't feel that those ambitions absolved him of his duty. "He's like . . . I dunno . . . some kind of fucking samurai about duty and honor," Bernie said. "And I kind of like him. And I don't see how we could get out of this mess. We don't have enough men to do anything, and not enough weapons, either."

"So we keep our mouths shut," Natasha said. "We wait and we don't cause trouble. For now, Sheremetev is busy making sure his position is consolidated. Shuvalov isn't the worst. Let's hope he's left in charge here."

* * *

The worst, as Anya well knew, certainly wasn't Colonel Shuvalov. In her opinion, the worst was Sheremetev. Shuvalov had the code phrase, so she now knew that the man who had her family—and the man she'd been reporting to for these last few years—was Sheremetev.

And what would Sheremetev do, once he was fully in power? What would he do to Anya?

Worse, what would Bernie and Natasha do once they found out she'd been spying?

As coldhearted as Anya had been when she started spying on the Dacha, as much as she had tried to remain coldhearted . . . it hadn't worked. She loved Bernie. Truly, from the bottom of her heart. He was so different, so gentle. And he loved her, had since almost the beginning.

Anya tossed and turned through another night.

* * *

"He's not the worst," Aunt Sofia pointed out.

"He's not the worst, he's not the worst, he's not the worst," Natasha chanted and threw her hands in the air. "I know perfect well that he's not the worst, dammit."

"You've been around Bernie too long," Sofia said. "Stop using that word, even in English."

Natasha turned a stone face to her. "He's not the worst. But he's not what I want."

"What do you want, child?"

"I don't know yet. I haven't had a chance to learn what *I* want." She paused a moment. "I want Vlad. I wish I could talk to my brother."

* * *

"Damn their eyes!"

For a moment, Brandy thought Vlad was quoting another book. Then she realized that he was angrier than she'd ever seen him.

They were in the salon. She was reading a book and Vlad was trying to catch up on the endless paperwork. He'd just opened the latest dispatch bag from Moscow. "What's wrong?"



"You know that delayed mica shipment?" Vlad leaped out of his chair and began pacing. "It wasn't delayed because of weather or bandits. Well, not real bandits. The *Duma* delayed it. On purpose. They've also taken Czar Mikhail and his family hostage, along with that nurse and her family." He thrust the letter toward her. "Look at this! Just look at it!"

Brandy was forced to push the papers away from her face. "Calm down, Vlad. And talk sensibly. What else has happened?"

He pulled the papers back, then read from them. "Because of it's vital importance to the state, the Dacha has been placed under guard." Vlad threw the paper across the room. "That means they've got Natasha. And Bernie."

* * *

Over the next few days, after Vlad had calmed down a bit more, Brandy was able to read a translation of the offending papers.

Czar Mikhail and his family were safe, if being held hostage was safe. Not that they were officially being held hostage they had "been moved out of Moscow to ensure the Czar's safety". The up-time nurse and her family were being held in the same place as the czar, so, again, they were safe. The manager at the mica mine, while nothing had yet been done to him, was being held under suspicion of "involvement in the recent unpleasantness." Accusations of corruption had been laid against the manager . . . and against Vlad himself.

No shipments of anything would be sent from Moscow or from Vlad's own lands. He was, effectively, broke.

Bernie and Natasha along with the rest of the Dacha staff were in "protective custody."

Somehow, Brandy just didn't like that term.

The Dacha

Fedor Ivanovich Sheremetev rode his horse up to the gates of the Dacha compound at the head of a troop of personal cavalry. He had still not made up his mind what to do about the Dacha. His cousin, Ivan Petrovich, wanted it. Wanted it badly. And Ivan Petrovich, corrupt as he was, had support within the family and the *Duma* . Also, Fedor could rely on Ivan to crack down on the Dacha staff.

Which was, in a way, the problem. Ivan Petrovich would squeeze the golden goose all right—but he just might choke it to death. And the Dacha had been laying right well over the last couple of years. Among other things, it had laid the logistics for the dust up with Poland. Which had put Russia in a better position than it had been in for twenty years.

A lot depended on how well Leontii Shuvalov's suit was progressing. If the Yaroslav girl, Natasha, was proving difficult, Fedor might have to go with Ivan Petrovich because he could not afford to have the Dacha or the Gun Shop running loose. He got down from his horse with difficulty and shook Leontii's hand. "How goes your suit?"

"Reasonably well, My Prince," Leontii said. "Natasha understands the situation. I won't say she is thrilled, but I doubt she will fight it."

"And how do. . ." Fedor paused as the lady in question arrived. "We'll talk later."

Later, in the main office

"The letters have gone out to Poland, what's left of the Holy Roman Empire and the Turks," Sheremetev said. "I'm not sure of the Polish Lithuanian Commonwealth, mostly because Wladyslaw can't seem to get over the notion that he should be czar of Russia, but who knows? I expect to have better luck with Murad. He's a pragmatic mad man. Who will be happy enough to get up-timer tech as long as the up-timers aren't mentioned. I don't know which way Ferdinand will jump."

"And the riots?" Leontii asked.

"Worked quite well at distracting Mikhail's adherents and added enough between him and the bureau men to cut off most of his information flow. They have also provided more than ample justification for cracking down on the bureaus. I think we have them put in their place for now." Sheremetev snorted "Button clerks, the lot of them. Self-important button clerks who have been getting above themselves

since the Time of Troubles. They needed to be shown the stick. We'll wait a few more weeks before we show them the carrot." Sheremetev was talking about a plan to put enforcement of the ties to the land in the hands of the government.

"Anyway, you will have heard the reports by now. So what do you think of Anya?"

"Ah. She is, ah . . . very informed on the workings of the Dacha, My Prince," Shuvalov said.

"But you don't think I ought to be depending on a peasant whore for information?" Sheremetev laughed at the colonel. "Leontii, my boy, the up-timers would call you a boy scout. The up-timers aren't entirely wrong about peasants. You can sometimes find a good tool even at the bottom of a dung heap."

"Perhaps so. But it's not that, or not entirely. Perhaps not directly."

"Oh? Something real then?"

"She is no longer a kitchen maid. At Bernie's instigation she was promoted and promoted again. Then promoted a third time, apparently on her own merits."

"I know that. She reported each promotion."

"Yes . . . but it had to have an affect on her loyalty."

"I have means of keeping her loyal." Sheremetev paused. "Was she holding something back?"

"Not that I could tell. I think she may care for Bernie—at least a little. Though she denies it. She truly doesn't like Natasha. That's clear enough. She offered me her condolences about the possibility of a union and I believe she was sincere. What bothers me is why she doesn't like Natasha."

"So why doesn't she like Natasha?"

"She says it's because Natasha is a phony liberal. But I think it's about Bernie."

"Is Natasha interested in the up-timer?" Sheremetev gave Leontii a sharp look.

"No." Leontii laughed. "Even Anya doesn't think that. But Natasha thinks of Bernie as sort of a younger brother, though I believe he is actually older than she is. And she is protective of him." He paused thinking. "I suspect that Anya is probably right in her assessment of Natasha's character. What Natasha thinks with her head is dangerously liberal. But what she feels in her gut much less so. She disapproves of Anya's relationship with Bernie because Anya is a peasant and she sees Bernie as a *deti boyar*. My point is that I don't think Anya would be nearly as upset with Natasha if she didn't actually care about Bernie."

"And that could be dangerous." Sheremetev nodded. "I'll look into it."

* * *

Prince Sheremetev did indeed look into it. He interviewed Anya and came away from that interview uncertain. She really was too valuable an asset to dispose of casually. She hadn't been at first, but by now she understood what was being built in the Dacha better than anyone else he had. That very knowledge made her more dangerous, should she betray him. And her temptation to betray him was rooted in her attachment, if there really was one, to Bernie, and to a lesser extent to the staff of the

Dacha. Shermetev began to smile.

That night at dinner Natasha asked the question that they had all been wondering about. "What is the situation in Moscow?"

Shermetev looked at her then turned to Bernie. "Are you familiar with the Tokugawa shogunate of Japan?"

Anya knew that before Bernie had come to the Dacha he would have been, at best, vaguely familiar with the history of Japan or the rule of the shoguns. However, while most of his education as a consultant at the Dacha was technical, some of it was historical, especially for what was now current history. And Bernie had ended up translating or helping to translate quite a bit of history.



"Yes, a bit, Prince Shermetev. Tokugawa Iemitsu is the current shogun. His younger brother Tadanaga has gone missing in this timeline. In the original he was ordered to commit suicide in 1633 or 1634. Whether he got word of his older brother's orders and escaped this time around or he was executed, I have no idea."

"I was speaking more generally," Shermetev said. "In Japan the emperor reigns but the shogun rules. Russia needs a strong hand at the reins, but doesn't need—can't afford—the sort of, ah, disruption that a dynastic squabble would produce. To provide the first while avoiding the second, I have taken on a role similar to that of shogun. Mikhail never really wanted the power of the throne anyway. This way Mikhail will remain safe, comfortable and secure as long as there is no trouble." He smiled.

It was, Anya thought, an extremely cold smile. The sort of smile a shark might smile.

Then he continued. "Mikhail's limited year was a good plan poorly executed. We do need more gold and silver to augment the paper money and to use in foreign trade. However, the way he did it without properly preparing the ground almost led to a revolution."

Anya didn't snort, not even under her breath, but she wanted to. Yes, the *dvoriane* were upset but they never would have rioted not without believing that they had support in the *Duma* .

"He had no means in place to ensure the loyalty of the service nobility," Shermetev continued. "That is why I have created the post of political officer. Russia had them up-time under Stalin's rule. They watched the service nobility, even if they called it something else in the twentieth century. Political officers

will be, ah, ideologically sound individuals. Mostly, but not entirely, *deti boyar* whose job is to make sure that their charges don't do anything stupid. I thought of using the church, but people get really upset about things like that."

Suddenly everyone was looking at Colonel Leontii Shuvalov.

Prince Sheremetev noticed and laughed. "Oh, not at all. Leontii is a fine man, but not nearly subtle enough for this. The new political officer for the Dacha is . . . Anya."

* * *

Will Anya and Bernie's survive the betrayal of trust?

Is Cass in prison, dead, or partying with a serving girl in the Gun Shop?

Will Natasha fall for the suave Colonel Leontii Shuvalov?

And what's in the Apple Onion Pecan Cakes?

For answers to these and other questions tune in next time to "Butterflies in the Kremlin, Part Eight, How the Bear Turns."

Stretching Out, Part Five: Riding the Tiger

Written by Iver P. Cooper



*Marshall's Creek, Suriname River
Long Dry Season, 1634 (July-November 1634)*

Maria Vorst sniffed the wound, and grimaced. "It's infected." Her patient shrugged stoically.

"How did it happen?"

Captain Marshall answered for her charge. "Not sure, but probably just a cut from razorgrass, or a spiny vine."

Maria shook her head. "The men have got to get into the habit of inspecting themselves from head to toe, every day. We're in a rainforest, for heaven's sake; any break in the skin is bad news. If it doesn't get infected, then maybe some fly decides it's a dandy place to lay eggs."

"I'll need to clean the wound, and put some antiseptic on it," continued Maria.

"Antiseptic?"

"Yes, from the Latin, 'against rotteness.' You remember my lecture don't you? The one on the Germ Theory?"

"Indeed. I had bad dreams several nights in a row. Little armored critters with sharp fangs and claws, hunting us in great packs."

"Back in Grantville, Lolly showed me what they look like under a microscope. Pretty dull actually. Little balls or rods, mostly." Maria, an artist whose family ran the Leiden botanical gardens, had received botanical and medical training in Grantville.

"Well, in my nightmare, they had fangs and claws."

Maria had come upriver on the yacht *Eikhoorn* to visit Captain Marshall and his little tobacco growing colony of English Puritans. And the nearby Indian tribe, who were tapping rubber for Maria's people.

Despite earlier tensions, the colonists at Marshall's Creek had welcomed the latest visit by the crew of the *Eikhoorn*. Especially by Maria. Not just because she was the first white woman most of them had seen since leaving England, but also because of her medical training in Grantville. She had made the rounds, treating the illnesses and injuries of Marshall's people.

"All right, you're going to need to hold still now," she told her patient. She cleaned the wound with a warm decoction of bark. She took out a little rubber pouch—it was easy to come by, now that the Indians near Marshall's Creek were tapping the local rubber trees—and squeezed out an ointment. It was the thickened sap of another tree. Maria had learned about both the bark and the sap from Indians down river, near the new Swedish colony of Gustavus.

Of course, the Marshall Creek Indians had their own remedies. As the Gustavan's "Science Officer," Maria spent quite a bit of time learning native medicine, everywhere she traveled.

Maria wrapped cotton around the man's leg, to protect the wound while still allowing it to breathe. Even though the local cotton was gray, it still stood out against the black of his skin.

For the first time, she had met Marshall's *other* people . . . his African "servants." There weren't many of them, but their existence had been concealed from her and Heyndrick de Liefde on their previous visits. She wasn't surprised. Even if Marshall had not been told, when friendly relations were first established, that slavery was illegal in the Gustavus colony, he might have feared that the interlopers might try to incite the slaves as a cheap means of wiping out their upriver rivals.

Heyndrick, the cousin and agent of the founder of the Gustavus colony, had told Marshall that the Gustavus colony would not, for the moment, insist that Marshall free his slaves, and wouldn't encourage the slaves to flee, but he also warned Marshall that it would not return any fugitive slaves who made it downriver.

But that didn't mean that Maria couldn't attack the institution in subtler ways. "I have tended to this man's physical needs, but what have you done for his spiritual ones? Has he been instructed in the Christian faith?"

Marshall shook his head. "Of course not. He is only an ignorant savage."

"His ignorance can hardly be surprising, if you refuse to instruct him." Maria knew that this was a sensitive point with English slave owners. Since one of the justifications they gave for enslaving the Africans was that they weren't Christian, they feared that if they converted their slaves, they might be forced to free them.

Marshall temporized. "We don't have a minister of our own."

"I understand. I wish I could do something about that. But, I know that as a captain, you have read aloud from a prayer book. Surely your African servants can be allowed to listen and to learn what they can."

"Very well."

"And have you tried to teach any of them to read and write?"

Marshall laughed. "Mevrouw Vorst, few of my Englishmen have their letters."

"That is most unfortunate. In this new world, illuminated by the books of Grantville, being literate is going to be of great importance. Is that not true?"

Marshall nodded slowly.

"Well, I will see what primers we can spare, and all I ask in return is that at least one be dedicated to the edification of the Africans among you."

Based on the reading she had done in Grantville, Maria was fairly confident that there would be trouble over slavery, sooner or later. But for the moment, the colonists in Gustavus had more immediate issues to worry about. Like survival. And she agreed with Heyndrick that it would be better if the confrontation came after Gustavus was bigger and stronger.

* * *

The music faltered. The dozen or so Surinamese Indians, resplendent in body paint and not much else, stirred uneasily. Until then, they had been an excellent audience.

"Don't stop!" Maria whispered sharply to her assistant, and made a circular motion with her hands.

The English settler who had been given the honor of turning the crank on her mechanical phonograph nodded sheepishly, and brought the player back up to speed.

The violins, viola and cello played by the musicians of another universe went back to work, and Wolfgang Amadeus Mozart's *Eine Kleine Nachtmusik* once again overrode the clicking and chirping of the insects of the rainforest.

Later that night, Maria tried putting on a Louis Armstrong record. Louis Armstrong had given the world such titles as "Alligator Crawl," "Trees," and "Rain, Rain." Despite this evidence of affinity, the Indians of

Marshall's Creek were unimpressed, indeed, a little agitated. It appeared that the rainforest was not yet ready for jazz.

Maria salvaged the situation by hurriedly putting on Mozart's piano sonata no. 11 in A, Rondo Alla Turca. Tempers were appropriately soothed.

* * *

Ceremoniously, the chief's wife handed Maria a cup of *piwari*. Maria took a carefully metered sip, and bowed her head in acknowledgment, hoping she had drunk enough to satisfy propriety. Piwari was a brew made with fermented cassava bread. Which wouldn't sound so bad, except the old biddies of the tribe chewed the bread and then spat it into the pot to ferment.



She couldn't help but remember a story Lolly had told her, about a practical joke played on a British diplomat. At some sort of exotic reception, a covered plate was put before him. When he lifted the lid, all that he saw was a spider. He stared at it, as his so-called friends watched him out of the corners of their eyes. A moment later, he grabbed it by the leg, announced, 'For the Queen,' and dropped it into its mouth."

So it could be worse.

After the meal, presents were exchanged. "And this is for you," Maria said, and handed the chief a strange ornament.

"It is like a piece of the rainbow," marveled the chief.

During her sojourn in Grantville, Maria had listened to CDs on her friend Lolly's player. She had also been introduced to the curious concept of the "coaster", a CD which was no longer functional, and hence suitable for nothing better than protecting the table from water marks. Maria asked if she could have a few of these specimens, and Lolly said, "Sure, why not."

Maria had them cut into quarters, and hole-punched. Maria gave one only to a chief, or his favored wife. They could be hung from the neck, so all tribesmen and visitors could envy how well, in one light, they acted as mirrors, and in another, they iridesced.

Though tensions had been reduced, there was still a certain amount of casual one-upmanship between the English and the Gustavans, as they both sought to win over the Indians of the Suriname River.

Maria was confident that the Gustavans had won this round. There was no way that Captain Marshall was going to be able to compete with the "rainbow."

***Fort Kykoveral (modern Bartica), Essequibo River, Guiana
November 1634***

Henriques Pereira da Costa, formerly of the Portuguese-Brazilian frontier town of Belem do Para, watched as a small cayman emerged from the Essequibo River and rubbed its belly on the river bank. It didn't have much time left to enjoy the afternoon sun.

"Henrique, would you believe that they only have six books, besides the bible, in the whole fort?" said his servant Mauricio. Mauricio had been trained by Henrique's father as a scribe and linguist.

"That many?" Henrique asked rhetorically. "I am surprised." Not that Henrique was much of a reader himself. He was more woodsman than scholar. He looked off to the west, toward the setting sun. Any moment now, he thought to himself.

"Five of them," Mauricio continued, "owned by the Commander."

The sun at last disappeared below the horizon. The skies darkened rapidly, that was typical of the tropics.

"As for the sixth—"

"Enough, Mauricio." Henrique took a deep breath, kneeled, and closed his eyes. "Hear, O Israel: the LORD our God, the LORD is one." Henrique was a *marrano*, a secret Jew, who had, when exposed as a "Judaizer," escaped into the Amazon with his servant and childhood companion, Mauricio.

Mauricio watched silently as Henrique prayed. Henrique had picked a location some distance from the fort, and out of its direct sight, so as not to give offense to their Calvinist hosts.

At last, Henrique completed the evening *shema*. He rose and looked at Mauricio. "There are some serious matters we need to discuss. Like what we do next."

"They don't seem to like us here much, do they?"

"Well, they're Dutch. Mostly Calvinists, too. They hate Catholics and they aren't too keen about Jews, either."

"Or free Africans, of any religion." Mauricio patted his pocket. "I keep my letter of manumission with me wherever I go, even in the jungle." Henrique's father, in his will, had instructed Henrique to make Mauricio a *curtado*, a slave who had the right to earn his freedom by paying a set price. Henrique instead freed Mauricio outright. But it was not until the two had made their way to Dutch-held Kykoveral that Henrique had acknowledged that they had the same father, and called him "brother."

"So, let me review our options." Henrique held up a finger. "First, we can make our home somewhere in the back country."

"Well, Kasiri and Coqui will be happy enough with that idea." In the course of their escape, Henrique and Mauricio had met the lovely Kasiri, and her brother Coqui. Kasiri and Coqui were Manao indians, from the distant Amazon.

Against all odds, they found their way to Fort Kykoveral, on the Essequibo river, and were welcomed by the Dutch commander. Only the welcome which Henrique received as a great explorer, had gotten a bit tattered once the Dutch realized he was Jewish. The Dutch were the least prejudiced of all the Christian peoples, but "least" wasn't the same as "not." And anyway, the Dutch didn't know quite what to make of Mauricio, Kasiri and Coqui.

"But I confess that while I am comfortable in the wilderness, I don't want to cut myself from civilization indefinitely." Henrique held up a second finger. "So the second possibility is that I can return to Europe."

"Right," agreed Mauricio, "we need to find you a nice Jewish girl."

Henrique gave him a quelling look. It had no discernible effect on Mauricio's smirk.

"We?"

At that, Mauricio lost his smile. Henrique, logically, should board the next Dutch ship, and return to Europe. His family had longstanding plans to help them make a quick getaway if they had to, and Amsterdam was the preferred rendezvous point. And it was uncertain that the Dutch in Kykoveral would tolerate the *permanent* presence of a Portuguese Jew.

But that would mean Mauricio would have to decide between crossing the Atlantic with Henrique or remaining on the Wild Coast with Kasiri.

* * *

Kasiri frowned. "What's troubling you, Mauricio?"

"Nothing."

"Right. My darling Mauricio barely speaks. He answers every question with a single word. It as commonplace as dolphins climbing trees."

Kasiri and Mauricio, of course, didn't talk to each other precisely like that. They communicated in a weird mixture of Manau, Portuguese and sign language, with many circumlocutions.

"Henrique doesn't think he can make his home here. He wants to cross the Great Sea to join his family."

Kasiri had never seen the ocean. To her the Great Sea was some sort of extension of the Amazon. And her people, the Manao, were traders, who made their home near the confluence of the Upper Amazon and the Rio Negro, but who traveled a great deal. So she just shrugged. A young man of her tribe, like Coqui, might travel hundreds of miles to visit, and perhaps take a bride home from, another tribe.

"And I am his brother and servant. I feel honor-bound to accompany him." Mauricio sighed. "Besides, if I don't, then I risk being re-enslaved by the Dutch. They are at war with the Portuguese, so they needn't honor my letter of manumission."

Kasiri smiled. "Fine, I will go with you across the Great Sea." Her frown reappeared. "Unless perhaps

you have tired of me?"



"Of course not! It would be wonderful to have you with me. It's just . . . customs are different in Europe . . . For one thing, you'll have to wear more clothes."

"Hah! I am already wearing too much. Do I not see how you, and your brother, and these crazy Dutchmen suffer every day? You all need to wear less and bathe more."

"Be that as it may, in Europe, in winter, it is too cold to dress lightly."

"What is cold? And what is winter?"

Mauricio abruptly gave Kasiri a hug. "Until a ship comes, we don't have to make a decision. And perhaps we should take a canoe up to the mouth of the Essequibo, so you can see what the ocean looks like, before we decide anything. For now, let's go swimming together."

Clearly satisfied that she had restored Mauricio's spirits, Kasiri walked with him to the river. But she didn't know that Mauricio was, beneath his surface good humor, still in doubt. Kasiri would suffer in Europe, unless she was willing to wholly adopt the language and manners of a European, like a Amazonian Pocahontas. And even then, as an Indian married to an African, she could expect to suffer all sorts of slights.

Mauricio wasn't eager to see white sails billowing over the dark waters of the Essequibo.

Gustavus (Paramaribo), Suriname

Maria returned to Gustavus with rubber, cotton and tobacco from Marshall's Creek, and Heyndrick told the colonists that it was time to do some trading with other Europeans on the Wild Coast. At the town meeting, they announced, "We are taking the *Eikhoorn* to Fort Kykoveral, on the Essequibo." It was the principal Dutch colony in the Guianas, perhaps two hundred forty miles to the west. "We need samples of everyone's products that might find a market there, whether among the traders, the Indians, or visiting ships. And we need your 'wish list' of what to try to get there which we don't have here."

It would, of course, be more than a mere trading voyage. This would be their first chance to explore the

coast, and Maria looked forward to seeing and drawing new plants and animals. And perhaps, just perhaps, some of them would be of economic value to the Gustavus colony.

At any rate, it was a chance to escape the ennui of helping to administer the colony. Maria now understood why David de Vries, their nominal leader, spent most of his time at sea.

On the coast of Guiana

They had made camp on a sandy beach, between the Berbice and Demerara rivers. They were now perhaps fifty miles from the mouth of the Essequibo. The next day's sail would be easy, with the trade winds broad on their starboard quarter. As, in fact, they had been every day on their trip westward. Getting back home to the Gustavus would be more arduous, of course.

As the tide went out, it became apparent that a little ways down the coast, there was some large object sticking out of the exposed bottom. Maria, Heyndrick and two sailors went out to investigate.

The object was the ravaged remains of the hull of a pinnace, its blackened framing timbers looking like the ribs of a sea monster. It didn't seem particularly likely that any useful artifacts would still be left, but they were now so close that it seemed reasonable to look and see.

"That's odd," said Maria. While Heyndrick and the sailors looked for stray coins, and the like, in the sand, she had been studying the hull.

"What's odd?" asked Heyndrick, who, out of the corner of his eye, had been studying *her* .

"Look how most of the wood is heavily holed."

"Sure, that's because of the teredo, the ship worm. They're a real plague in these tropical waters."

"Yes, but there is one piece that's barely pitted. You see? I think it's a different type of wood than the rest of the hull."

Heyndrick studied the mystery futtock more closely. He felt and sniffed it, and did the same to the nearby wood. "I think you're right. It couldn't have been part of the original hull, it must have been cut to make a repair."

"Can we take it out, please?" pleaded Maria. "I think it might be greenheart. It's a tree mentioned in the encyclopedias; it's resistant to marine borers. The crew of this hulk must have cut a greenheart tree and used it to make repairs, without realizing their good fortune. Might be a fine export product if we can find a grove to harvest. We can ask the local Indians . . . once we find them."

Heyndrick scratched his chin. "Even if you're right, the Indians are going to have a hard time figuring out what tree you are looking for, if all they have to go on is a bit of cut wood. They don't cut their trees into lumber, they just hollow them out."

"We can shave off the outer layers of the piece, then they might recognize it as being the same wood as one of their dugouts."

Heyndrick shrugged, and ordered a sailor to cut out the wood of interest. Once he had done so, Maria asked him to chop off a small piece and give it to her. She took it down the beach, to where the waters

of the South Atlantic played with the sand, and dropped it in. It sank.

Maria nodded thoughtfully, and turned her head to look at Heyndrick, who was standing a few feet behind her. "It's denser than water. That's true of greenheart, too. One of the reasons it's a strong wood."

"Then you might be right that it's greenheart, Maria, but please don't get your hopes too high. Even a wood that normally floats can sink if it gets waterlogged."

Maria shrugged. "When we find some Indians, we'll get some answers. I hope."

***Fort Kykoveral (modern Bartica), Essequibo River, Guiana
Short Wet Season (December 1634-January 1635)***

"Well, there it is. A sail," thought Henrique. "Kykoveral" meant, in Dutch, "looks over all," and he had an excellent view of the river from his position on the parapet.

It made him think of the legend of Theseus. Theseus had gone to Crete to slay the Minotaur. He sailed, with the other sacrifices, on a ship with a black sail, but he promised that when he returned victorious, he would hoist a white sail so his father Aegeus would know he had succeeded. Unfortunately, he forgot, and Aegeus threw himself into the sea.

This time, it didn't matter whether the sail Henrique saw was black or white. Either way, it would bring both joy and sorrow.

* * *

To Henrique's surprise, the ship, although Dutch-built, wasn't from Europe. Nor was it en route to the Caribbean, or America. Rather, it was from another colony on the Wild Coast, paying its respect to the traders at Kykoveral.

Which meant that perhaps, just perhaps, there was no need for the foursome to separate.

* * *

Commander Jan van der Goes of the Zeeland Chamber of the Dutch West India Company cleared his throat. "Mevroux Maria Vorst, permit me to introduce Henrique Pereira da Costa, formerly of Belem do Para, the intrepid discoverer of a river route between the Amazon and the Essequibo."

Henrique bowed.

"Senior da Costa, I introduce to you Mevroux Maria Vorst. She is the daughter of a physician, and sister of the curator of the Leiden Botanical Gardens. She has received training in natural philosophy at Grantville, the town of the future that you have surely heard of by now. She is attached to the new Swedish colony to our east, Gustavus." She curtsied.

"And her companion, Captain Heyndrick de Liefde, is of a good merchant family in Hoorn, and has been to the Caribees, Zwaanandael, Virginia and New Netherlands." Zwaanandael was the ill-fated Dutch colony in Delaware. "His cousin, David Pieterszoon de Vries," founded Gustavus, and Captain de Liefde has given us the great pleasure of transporting Mevroux Vorst to our company."

"Yours must have been quite a dangerous journey, Senor da Costa," Maria murmured. In the meantime, she was trying to visualize the up-time maps, and guess at its length. Twelve hundred miles? Sixteen hundred?

"Indeed it was, my lady. Giant crocodiles. Poisonous snakes. Deadly rapids. A thousand times, I thought myself at death's door, and took solace in the thought that I would be taken into Heaven. And then I made it here. And now I must wonder whether I died after all, and have come to Heaven, for surely you are an angel."

Heyndrick rolled his eyes.

Maria smiled at Henrique. "Surely it is too warm here to be Heaven."

Heyndrick saw the smile. "I am surprised that you speak so blithely of Heaven, Herr da Costa. The guards told me that you are a Marrano, a secret Jew, wanted by the Inquisition for heresy." Having been baptized, however insincerely, Henrique could not avow Judaism without being considered a heretic.

"I am a heretic only in the eyes of the Catholic Church, not in the eyes of the Lord," Henrique retorted. "And I daresay that the Catholics would consider you, too, to be a heretic, Captain." Heyndrick was indeed Protestant.

Commander van der Goes winced slightly. "Tell me more about your colony, Mevrouw Vorst."

"We have both a sawmill and a glassworks, the first on the Wild Coast, I believe. So we have manufactures which we can sell here and to other colonies. We have shipped home a kind of clay called bauxite. We have planted, as cash crops, cotton, tobacco, and the dye tree orlean. And we are collecting the sap of a strange tree which I doubt you would have heard of, since, until the coming of the up-timers, the only Europeans who knew of it were a few Spanish, and they had no use for it."

"Oh, what tree is that?"

"It is called the rubber tree, the up-timers know much about it. Its sap hardens into a material which is waterproof, and is elastic, an—"

"I know what rubber is!" Henrique interjected. "That is what I was collecting, in Brazil!"

Maria spilled her drink. "In Brazil? How did you learn of it? Have you shipped any to Europe? Who is buying it? I would have heard if, before I left, someone was selling Brazilian rubber in Grantville. And that's the only market for it."

"Dear lady, I suspect that my family knows about it the same way you do, we have some connection who has studied the books of Grantville. In 1632 I was given a map, and a description of the tree. We started tapping the trees in the summer of 1633, and the first shipment went out soon thereafter, on one of the sugar ships out of Bahia. When rubber first reached Lisbon, I know not." He was too polite to mention that, beside storms, the likeliest reason for the rubber not reaching Lisbon was interception by privateers. Dutch, French or English.

"And I don't know what my family would have done with the rubber. It might have been some time before they sent samples to business associates outside of Portugal or Spain, and in these troubled times it could have taken many weeks to reach Grantville. It is somewhere near Magdeburg, is that right?"

"Hmm . . . we left Hamburg in December 1633. That would explain why we heard nothing about it. Is Belem still shipping rubber to Portugal, you think?"

"It is hard to say. Mauricio and I were the only Europeans involved in the tapping operation. We are both here now. The same . . . incident . . . which led me to leave Belem, would also have had unpleasant repercussions for my family. I hope they were warned, and fled in time. The Inquisition seizes the properties of heretics. It is possible that they will read the private papers, decide that rubber trees are worth exploiting, and send an agent to Belem to take over the business. More likely, they will decide it is too much trouble, or tainted by its association with Grantville, and the Indian *seringueiros* I recruited will just return to hunting and fishing."

* * *

"We will have to ask Henrique and his friends to join us at Gustavus," said Maria.

Heyndrick snorted. "I think that would be a mistake, Maria. Henrique's allegiance is to Portugal, and, so long as Philip rules Portugal, the Portuguese are our enemies."

"But now that they know he is Jewish, he cannot return to Portugal. He must find a new home. He was born and bred in the New World. What would he do in Europe?"

"I still think he would be a bad influence. His whole life has been a lie. We can expect him to have imbibed deceit with his mother's milk."

"Heyndrick . . . I do believe you're jealous."

Heyndrick took a deep breath. "I have no claim on you . . . other than one of friendship . . . and affection." He didn't dare say more, not yet. She was of substantially higher rank than him, although not hopelessly so.

"I have already married once and have been a widow for several years. I have become accustomed to making my own decisions. And the good women of Grantville have taught me that I need be in no rush to remarry.

"Which isn't to say that I don't like you. . . ."

"Now then. Back to business. And Henrique, flowery compliments and all, is strictly business. He has run a rubber tapping operation. We could use him to do so for us, up at Marshall's Creek, and at the same time keep a closer eye on Captain Marshall and his men."

Heyndrick nodded slowly. The thought occurred to him that if Henrique were in residence at Marshall's Creek, then Maria wouldn't have to travel there so frequently. And he would be mostly out of Maria's sight and hence out of Maria's mind. Or so Heyndrick hoped.

But suddenly he realized that Maria was still speaking. "And if he was able to cross over a thousand miles of rainforest, he must have impressive survival skills . . . and no doubt an impressive knowledge of the plants and animals. Some of that knowledge will doubtless be relevant here in the Guianas, too. In fact, I have a question or two to put to him right away."

"Greenheart?"

"Greenheart."

* * *

"Senor Henrique, I am looking for trees with a particular wood, called 'greenheart,' because it is of a

dark green color. It grows"—she stopped to consult her notes—"seventy to one hundred thirty feet high, and three feet or more in diameter. It is very strong and heavy, heavier than water. And I think I found some lumber cut from it, in a ship's hull, but of that I am not sure. Here is a sample piece."

Henrique examined Maria's mystery futtock. "It was used in a ship? And it is strong, but too heavy to float? Perhaps it is like the 'stone tree,' *itauba*, which we have on the Amazon. Coqui had a dugout canoe made from that tree. It is good for running rapids, but if the canoe fills with water, it sinks."

Mauricio coughed. "I don't suppose you have any idea what the native word is for this 'greenheart' of yours?"

"Actually, I do. At least if the encyclopedias in Grantville are right. They said that it was called 'bibiru' or 'bebeeru' in one language. And 'sipiri' in another. But I don't know which language."

"Bibiru," Henrique muttered. "Sounds like a word from the language of the Indians who live just north of the Amazon delta. They call themselves Aroo-waks, I think. Are there Aroo-waks, here? 'Bibi' is 'mother,' I think. Or maybe it's just 'woman.' But I don't recognize 'bibiru.' Do you, Mauricio?"

Mauricio shook his head. "Not 'sipiri,' either. Do the 'encyclopedias' say what the Indians use the tree for?"

Maria wiped sweat from her brow. Guiana was warm even in December. "Not clearly. But the wood is used in the construction of ships and docks, and the bark to make some sort of febrifuge. Probably tastes vile."

"Isn't that something that the physicians insist on?" asked Mauricio. "Don't they figure that the worse a medicine tastes, the better it is?"

Henrique laughed. "Presumably on the theory that the patient will get better so he doesn't have to keep drinking the medicine."

Mauricio shifted his weight. "Excuse me, Henrique, I have to go," said Mauricio. Kasiri is waiting for me."

Henrique waved him off. "And if the lovely and learned Maria is through questioning me, I have some business with the commander." Maria inclined her head, and he and Mauricio both took their leave of her.

"I wonder if Lolly knows any nice Jewish girls I can match him up with?" Maria pondered.

* * *

The local tribe was called the Lokono, which of course just meant "the people" or something like that. Henrique, Mauricio, Kasiri and Coqui introduced Maria to their Lokono Arawak friends, and helped her with her inquiry. They knew the tree, or at least they knew of some tree they called "bibeera," which sounded close enough. At least, the tree was tall enough, and its wood didn't float. Some young Lokono women led her up the hilly banks of the Essequibo river, and pointed out several "bibeera" trees to her. They had the growing pattern common to many rainforest canopy trees; that is, branching only near the summit. Maria judged these specimens to be a good eighty feet tall.

The Lokono showed her how to remove the cinnamon-brown bark; it had to be beaten before it could be peeled off. The yellowish infusion they made from the bark tasted just as horrible as Maria had

expected. It made up for this by smelling nasty, too.

Two of the sailors had come with Maria, and, on her instructions, cut down a few of the trees, trimmed them to logs of manageable size, and skidded them back to the *Eikhoorn*. Back in Gustavus, the carpenter would test them out and, if they were as good as the encyclopedias said, they would send the supply ship on to the Essequibo, with orders to pick up a cargo to take back to Europe for sale. Assuming that Maria and Heyndrick didn't find a greenheart stand closer to their own colony.

Henrique, Mauricio and Kasiri decided to go swimming; this stretch of the Essequibo was pleasantly free of piranha, electric eels, and crocodilians. Coqui watched Maria and the Locono women for a while, then grabbed his bow and headed to the river.

In the meantime, Maria noticed that the larger of the trees were surrounded by nuts the size of apples. She decided that it might be advantageous to collect these, and plant them near Gustavus. If the greenheart trees were useful, it would be better if they didn't have to go each year to Essequibo to harvest them.

As she put the nuts in her basket, the Lokono women started giggling. She tried to figure out why, but her linguistic skills weren't up to the task. One woman did pat her own tummy. Maria took this to mean that the nuts were good to eat, but the Lokono didn't seem interested in sharing Maria's haul.

Maria returned to the fort, basket in hand, and got out her sketchbook. It wasn't until sundown that Henrique and company came back.

"What is it that the Indian women find so funny about me being interested in the nuts of the greenheart?"

"Mevrouw Vorst, it will be an honor and a pleasure for me to find out," said Henrique, bowing. He and Mauricio went off in search of their Lokono friends, with Coqui and Kasiri trailing behind.

Curiously, at the dinner table, Henrique wasn't quick to share his findings. Maria managed to contain her impatience until they were all done eating. "Well, Henrique, what did you find out?"

Henrique looked at Mauricio. Mauricio looked at the ceiling.

Henrique also seemed to have trouble looking straight at Maria. "Mevrouw Vorst. Umm. They use the nuts to, um, keep from having babies."

* * *

Coqui wasn't thinking about babies, but he was devoting some thought to the related subject of women.

He had decided to join Henrique, Mauricio and Kasiri on their little trip because he wanted to find a mate. And none of the girls of his own village appealed to him particularly.



As they made their way down the Rupununi, they had passed through the lands of the Wapishana and the Macushi. Unfortunately, they had done so at the time that the upper Rupununi was in flood, creating a great lake that bridged it to the rivers of the Amazon. While that made travel relatively easy, it meant that it was hard to fish, and the Indians of the region spent that season mostly in the uplands, where they could hunt land game.

The bottom line was that he hadn't met any eligible females en route. As to the women of the Lokono Arawaks, they fell into three categories. The pretty available, ones, who had struck up relationships with the Dutchmen at the fort. The pretty, unwilling, ones who had prudently moved deeper into the forest, where they could avoid unwanted advances. And the old women who insisted on flirting with him at every opportunity.

Logically, then, he should go deeper into the forest, but he was reluctant to trust his sister Kasiri to the highly dubious wilderness skills of her new boyfriend, Mauricio. It was too bad that she hadn't picked Henrique, who was actually competent. For a European.

This Maria said that there were Indian women near her colony. He would have to investigate.

Paramaribo (Gustavus)
Short Dry Season (February-March, 1635)

The black schooner rounded the sandy spit which marked the eastern edge of the entrance to the Suriname River. As it continued westward, it came into view of the recently constructed Fort Lincoln, which lay on the broad vee of land between the mouth of the Comowine River, and the main channel of the Suriname River. Gustavus itself lay on some distance further up the Suriname, on the west bank, where the ground was less prone to flooding.

Fort Lincoln, at this point, was more bark than bite. Most of its "cannon" were actually artfully blackened logs. However, there was just enough real ordnance to fool an enemy ship which merely

wanted to test the defenses. For all it knew, if the fort didn't fire all its guns, perhaps it was just conserving ammunition.

Captain Dirck Adrianszoon, the original skipper of the *Eikhoorn*, and acting fort commander, lowered his spyglass.

"Slaver," he said.

"How can you tell?" asked Heinrich Bender. He was a member of the colonial militia.

"From the smell. Just wait for the wind to blow this way again. Want a look-see?" Dirck handed the spyglass to Heinrich.

Heinrich adjusted the focus; he was near-sighted. "You think they're here to sell slaves?"

"That's one possibility."

"Hey, that's a Spanish flag they're flying. That means we should shoot at them, doesn't it? Since the Netherlands, the SOTF and Sweden are all at war with Spain."

"The international law on the subject is a bit complicated. The Spanish supply slaves to all the Caribbean plantations, and so they probably have papers granting them immunity from privateers and warships of any country. At least, those which buy slaves, like the Dutch, the English, and the French. I am not so sure if the SoTF and Sweden will honor the papers."

On Dirck's command, Fort Lincoln fired a signal shot, warning the visitor to keep its distance, and alerting the settlement upstream that company had come knocking. The schooner prudently anchored several miles away, in two fathoms of water. Soon thereafter, it lowered a longboat.

Dirck walked out to the beach to meet them; he didn't want the Spaniards getting a closer look at his guns.

The longboat crew was led by the first officer of the *Tritón*. Their ship, an eighty tonner carrying two hundred slaves, had left El Mina several months ago. It had misjudged its position, gotten caught in the doldrums and run out of water. Crew and cargo alike were in desperate straits.

"And so, Senior, we beg of you that as a good Christian, you tell us where we may find drinkable water, that we may refill our casks and be on our way. We are willing to pay, of course, for the privilege. And naturally, if you wish to buy any of our merchandise, we can give you a special price."

Dirck told him that he would have to get permission from the governor of the colony, at the main settlement. Dieter promised that he relay the Spanish requests at once, but warned that the Spanish must stay where they were until a decision was reached.

* * *

Carsten Claus, the acting governor of Gustavus, and a CoC activist, was in favor of attacking the ship and freeing the slaves. Maria agreed, and Heyndrick, though less enthusiastic, admitted that their up-time support would evaporate if they did anything else.

But it wasn't as though Carsten had a company of Marines he could order into battle. What he had instead was the crew of the *Eikhoorn*, some sailors, from other ships of David's flotilla, who had been

left behind nine months earlier to recuperate from illness or injury, and the settlers themselves. Some of these had served in village militias, and a smaller number were ex-mercenaries, but it was hardly a professional force. Carsten decided that he would have to persuade the colonists to take action. So he called a meeting of the town council.

"What's the problem?" asked Denys Zager. "Make them pay through the nose for the privilege, and send them on their way. It's all profit and no risk."

"If you are worried about risk, why did you come to the New World?" complained Michael Krueger. "You're Dutch, aren't you? Here you have a heaven-sent opportunity to combine patriotism with profit. Capture the ship, and then sail it to a neutral port—St. Kitt's perhaps—to ransom off the crew and sell the slaves."

"Do you remember our journey here?" said Bender. "How, as we passed the Canaries, we feared that every ship on the horizon was a Turkish slaver? If it be wrong for them to make you a slave, though you be their enemy, how can it be right for you to take as a slave an African who has done you no harm? Who has not consented to serve you? Can that be Christian?"

"Of course it is Christian," said Krueger. "Did not Abraham own slaves?"

"In the time of the up-timers, all of the great nations made slavery unlawful," Maria added. "Every religion condemned it as sinful. History judged us, and found us wanting. Now, through God's grace, we have the opportunity to choose a more righteous path."

"Have any of you brave souls considered that these slavers are heavily armed, in order to keep the slaves in line, and stand off pirates?"

"I have," said Heinrich. "What of it? Captain Adrienszoon says there probably aren't more than twenty to thirty of them. We outnumber them perhaps ten to one. And we have more and bigger cannon than they do."

"Wearing a militia badge on your hat doesn't make you an experienced fighter," Zager warned. "They may be more trouble than you think."

Krueger was unimpressed. "They have been dying of thirst for days, maybe weeks. I doubt they'll put up much of a fight. And we have our own "sea beggars," the crew of the Eikhoorn, and the men the other ships left behind. As well as the town militia. The profit from capturing the ship, and the cargo, is worth the risk."



"I agree that we should capture the ship, if we can," said Carsten. "But it is wrong to keep slaves. And anyway, slaves aren't very productive. Give them farmland and tools, and we and they will both profit more in the long run."

"I agree," said Johann Mueller, the glassmaker. He had been doing well enough trading beads with the Indians.

"Give them farmland," said Zager, "and they will steal the tools and disappear into jungle. Probably after cutting our throats." Zager, their sawyer, had a tendency to see the worst in human nature. Probably thanks to the years he had spent, as an apprentice, as the low man on the saw. The one in the saw pit.

Maria held up her hand. "They will see us tie up the slavers and strike off their chains. Surely they will understand, 'the enemy of my enemy is my friend.' Freeing the slaves would double the size of the colony. And we have Mauricio to interpret for us. Make sure there are no misunderstandings."

Carsten nodded. "They can be settled on the other side of the river. Less friction that way." And so it was agreed. Although not without some lingering dissent. Mostly with respect to freeing the slaves. The *Tritón* was no mere *jacht* like the *Eikhoorn*; it would come in very handy even if they didn't sell it off.

* * *

There was still the practical issue of how to assault the ship. The *Eikhoorn* just had six swivel guns. Fort Lincoln and Gustavus both had cannon, brought over when the colony was established, but the *Tritón* was out of their range.

Consequently, the following morning, the Gustavans invited the *Tritón* to go up the Suriname River and dock at Gustavus pier. The pier was brand new, with pilings made of the greenheart brought back by the *Eikhoorn*.

"You can't stay anchored out here, the bottom won't hold the anchor if a storm comes in. As often happens this time of year. Just tie up at our dock."

And once they docked. . . . "Ordinarily we would sell you our water, but it is the dry season now. There is a very reliable spring, upriver. You go up the river until the river turns sharply through twenty-four points of the compass. It then enters a long straightaway, and then veers to port. Just there, you will see a

hill in front of you, on the right bank. There is a tree which was split by lightning just below the spring, you can't miss it. If you leave before the tide goes out, you can probably make it back tomorrow." Carsten paused for effect.

"Only, the natives there give us trouble from time to time, so be sure to bring plenty of men, well-armed."

"Can you give us a guide?"

"Certainly, if you can wait until the day after tomorrow. That's when we expect the fellow back."

The first mate of the *Tritón* looked at his captain, and said softly, "I don't know if we can last that long."

Carsten had thought that would be the reaction. And if it hadn't been, Carsten could have stalled a bit more, without fearing that the *Tritón* would try to seize a guide. The *Tritón* was under the guns of *Gustavus*, after all.

"Go at once," ordered the Captain. The first officer of the *Tritón* crammed the longboat full of empty water casks, and sailors armed to the teeth, and headed upriver.

"So, Captain," said Carsten, "perhaps you would care to join me for dinner. I am sure you will be surprised at the hospitality which our rude young colony can afford you."

* * *

He was surprised all right. He had just recovered from bowing to Maria when he was quite conclusively coshed from behind. The burly Heinrich Bender, their blacksmith, smiled with satisfaction.

* * *

A plank connected the *Tritón* to the dock. It was guarded on the ship's part by two sailors, armed with pistols and cutlasses. And the town in turn guarded itself from an unwanted incursion from the ship by posting watchmen at the shore end of the dock.

The townspeople thoughtfully hung a lantern on the dock, so the *Tritón*'s guards could see what was happening there. If, incidentally, it destroyed their night vision, so they couldn't see anything moving in the water on the far side of the ship, well, so be it.

The town watchmen were far enough from the lantern so they couldn't be seen too clearly by the deck guards. However, they were clearly enjoying their night out under the stars, laughing and drinking.

The *Tritón*'s deck guards could watch this in silence only so long. One looked at the other, received an affirmative nod, and stepped onto the plank. It creaked, and the town watchmen immediately stopped celebrating and looked up. Very slowly, the approaching *Tritón* sailor set his pistol and cutlass down on the dock, and then walked toward them.

"I couldn't help but notice . . . that you seem to be drinking something. Perhaps you have something to spare?"

"I don't know," said the head watchman doubtfully. "Do you have coin?"

"I wish," the slaver responded dolefully. "We don't get paid until we get to Hispaniola."

The head watchman sighed. "Well, in the interest of international amity, we can share."

He handed over a skin. This is our little local specialty. It's made from a fruit which grows here, *ananas*. Some people call it pineapple." He declined to mention that the little beverage was then distilled—it was handy having a glassmaker in the colony—to ninety proof.

So far, so good. Carsten had told him, "Don't just go up and offer them a drink, let it be their idea. And feign reluctance."

The mood of the erstwhile ship defenders passed from celebratory to somnolent. The head watchman gestured to the waiting assault team. The two *Tritón* crew members were quickly gagged, bound and dragged off.

From a point out of view of the deck of the *Tritón*, a colonist used a hooded lantern to signal to the *Eikhoorn*, which was waiting quietly downstream. It slowly approached the other side of the *Tritón*, moving on muffled sweeps.

With the *Eikhoorn*'s swivel guns commanding the deck of the *Tritón*, there was no reason for further delay. One of Coqui's arrows, six feet long, took down a man who came up on deck as the assault team, lead by Heyndrick, snuck onto the dock. It was the wrong time to use the head.

The assault team came across the plank, and spread out quickly. The most experienced fighters opened the hatches and jumped down. The second mate was surprised in his hammock. The most resistance came from the cook, who was obviously both a light sleeper, and a man who liked to keep the tools of his trade close at hand. The cook managed to grab one of his knives and threaten to carve Henrique into little pieces. Henrique maneuvered him so his back was to the entranceway, and another Gustavan put the cook back to sleep.

The rising sun reddened the waters of the Paramaribo.

"The slavers' longboat just came around the bend." said one of the Gustavans, crouching beside the readied cannon. There were perhaps a score on board.

"Good," said the gunner. "The angle is set. When it comes even with that rock—the one whose top looks like a parrot's beak—light the fuse and blow the sucker out of the water."

The longboat crew couldn't possibly have seen the lit fuse. But they may have caught a glimpse of the men hiding by the cannon. For whatever reason, at the last moment, they backed water, and the ball missed them. Just barely, they were still sprayed.

With surprise lost, the Gustavans brought other cannon into action. A second shot was fired, then a third, bracketing the longboat.

The longboat might nonetheless have tried to reach the *Tritón*—figuring, with some justice, that a colonial militia probably weren't skilled artillerymen—but at that point the *Eikhoorn*, which had been downstream, swept past the prow of the *Tritón*, her swivel guns all manned. They were formidable anti-personnel weapons.

The longboat swung around, trying to claw its way back upriver, and out of the range, at least, of the fort's cannon. The first officer of the *Tritón* might well have intended to beach the longboat as soon as he was safe from cannonshot, and lead his men inland, to neutralize the *Eikhoorn*'s swivel guns, too.

However, in changing direction, it lost speed, and that made it a better target. A cannonball holed it, and the longboat sank quickly.

* * *

The *Tritón* —newly dubbed *Der Vrijdom*— was now anchored in two fathoms of water, off the east bank of the Suriname River. The slaves were brought up from the hold as gently as possible, still shackled.

They stood blinking in the sun, knowing that there were strangers on board, but knowing the significance. Then the former crew of the *Tritón* were brought before them, in shackles. Even the captain, his mouth gagged because he had demonstrated an amazing gift for continuous invective.

The slaves' eyes widened as they took in this sight.

Then Mauricio, the only black among the Gustavans, came aboard. Heyndrick had loaned him a military uniform. Maria had put a harpy eagle feather in Mauricio's hat, and hung one of her iridescent CD quarter-slices around his neck. The inner circle—Carsten, Maria, Heyndrick, Dirck and, to Heyndrick's annoyance, Henrique—had decided that Mauricio would be their most convincing spokesman, and that he should be "dressed to impress."

Mauricio knew several of the African languages. He gave the slaves the same message in each of them. They were about to be set free. Their captors were now captives, but were not to be harmed. The Africans were now among people who wanted to be their friends. Their new friends couldn't take them back across the sea, but could give them a new place to call home, so long as they behaved as good neighbors. They would help each other.

Mauricio made a grand gesture. Heinrich Bender produced the key—taken from the second mate—and unlocked the shackles on the nearest slave. The poor fellow virtually collapsed, but Heinrich caught him. Henrique gave him water to drink, and another colonist led him down to a waiting dinghy for transfer to the shore.

Mauricio motioned the next African forward.

* * *

"We are riding the tiger, Maria," said Heyndrick softly. "We don't know if these ex-slaves are warlike or peaceful, thievish or law-abiding. They are in a strange land, and they will have a hard time surviving. They will be tempted to prey upon us. Even if they don't, their gratitude may ebb quickly, and we may find that they refuse to trade with us, and occupy lands which we could put to better use ourselves."

It is safe to ride a tiger if you have friends to help you dismount," said Maria.

* * *

To be continued in *Grantville Gazette* 20

Author's Note

In the old time line, David Pieterszoon De Vries founded a colony at modern Cayenne, in French Guyana, in September, 1634. He went off privateering, and in December, 1634, while he was away, his colonists decided to seize a Spanish slave ship which had come in search of drinkable water. They didn't free the slaves; they sold the ship, the slaves, and the crew in Jamaica, and abandoned the colony. Most

of them did not profit from this from this act of piracy and betrayal. The two ringleaders, English ex-pirates, had persuaded the other colonists (who didn't speak English) to sign an English contract of indenture, each signer thinking it a credential that helped prove that he was a legitimate sailor and not a pirate. The ex-pirates sold the indentures in Jamaica, too. The other colonists thus all passed into bondage themselves. Which proves that truth is stranger than fiction.

Sonata, Part Four

Written by David Carrico



Movement IV—Presto Furioso
Grantville - April, 1634

Thomas Schwarzberg plopped a pile of manuscript pages down on the table in front of Amber Higham. "Done. That is the last of the pieces Franz desired for the concert—the full score and all the instrument parts as well." He rubbed at weary eyes. "I believe I shall sleep for a week." He pushed a smaller package over to Marcus Wendell. "And here is the second copy of the full score. Your student Dane was copying it as quickly as I finished the first copy, sometimes picking up pages even before the ink had dried."

"Good." Marcus smiled. "He's a good kid. I was glad to see him volunteer for this. From a music standpoint, too bad he's got to do the army thing. He could train up into a pretty fair musician, especially since he plays tuba." He looked to Thomas. "So, Franz is well into rehearsals now, I hear?"

Thomas nodded. "Already Franz has adjusted his program. He has dropped the Albinoni *Adagio*, partly because the transcription for orchestra only instead of the original organ and orchestra did not work as well as he thought it would, but also in no small part because it is taking more time to rehearse the pieces than he thought it would." He grinned. "I think that our Franz feels the time running like sand through a glass."

"Forget Franz," Amber said. "What will Mary think?"

Marcus shrugged. "Nobody's tried to do what we're doing so quickly. We're making this up as we go along. Mary will have to accept what can be done for this year. We'll build on it for next year. Frankly, I'm surprised as all get out at what's been accomplished."

"So." Amber looked up from her notepad. "Is that the last of the music to be sent to Magdeburg?"

"No, please," Giacomo spoke up. He pushed his own pile of pages forward. "This is the work that Franz Sylwester asked of me. It should have been ready before now, but when Father Kirchner asked me for the Passion, this was put on the back burner. But here it is at last, the *Variations and Etude on Geminiani's Concerto Grosso in E minor*. It is not difficult. The players, they will find it easy."

Heinrich Schütz reached out and picked up the full score of the piece to leaf through it. "Nicely done. Arranging the concerto from a handful of instruments to the full orchestra, good work that is. It will sound well."

Giacomo felt a flush of pleasure at the praise from his peer. He nodded his thanks.

Amber reached out and made the two stacks of music in front of her into one. "Is that all of it?" Receiving nods from around the table, she continued, "Have Dane give me his timesheet, Thomas, so I can cut him a check. I'll cut yours and Master Giacomo's at the same time. Now, is there any other news that I should send to Magdeburg along with this?"

"Tell Franz that the wind instrument students are making good progress," Marcus said. "Especially the brass players. He may have some of them earlier than I guessed, maybe even by the end of the year."

The down-timer musicians—Master Schütz, Thomas, and Master Giacomo himself—all took notice. "That is very good news," Master Schütz said. "Good news, indeed."

"Even the woodwind players are starting to make progress, once they got over having to learn from Errol Mercer and some teenagers in the band." Marcus shook his head. "Bunch of prima donnas. Worse than horn players . . . and I can say that—I am one." Amber laughed, but nobody else got the joke. "I had to read the riot act to the players learning clarinet and saxophone about working with Errol. He was about to walk on me because they were complaining so much about being taught by someone they felt was not at their level." Marcus nodded at Master Schütz. "Once I invoked your name, sir, they quit talking and started practicing. They still may not be happy about the situation, but at least they're working at it now and not complaining."

There were smiles around the room as Master Schütz's mouth quirked. "I am glad to have been of service in your new world of music, Master Marcus."

* * *

Giacomo fell into step with Heinrich as they left the meeting room. "So, my friend. How are you faring?"

Heinrich looked at him soberly. "I believe I am well. Pastor Johann Rothmaler from Rudolstadt has spent much time with me, several conversations. His wisdom and compassion have led me through darkness, and I have found a means of accepting Grantville and everything it brings."

"It is not easy to confront the future." Giacomo nodded. "I know this as well as anyone. It is good to hear that you are at peace with it."

"I am not sure if I am at peace with it or in spite of it." Heinrich gave a slight smile. "But yes, my mind is settled now, and I am ready to move forward."

The two men talked for a moment more at the front door to the building, then Heinrich said good night. Giacomo watched his friend walk away, relieved to hear that his distress had been allayed.

Amber Higham stepped up beside Giacomo, surprising him.

"Frau Amber . . . I thought you had already left."

"No, I was right behind you coming down the hall." She paused for a moment. "I had heard some time ago that Master Schütz was having a little difficulty dealing with Grantville. I overheard your discussion with him just now. Is he all right?"

"Yes," Giacomo said, "I believe he is."

"Good." Amber gave a firm nod. "I like him."

Magdeburg - Late April, 1634

"No, no, no, no, NO!" Franz brought the rehearsal to a halt. "Violas, how many times must I say it? At the fourth measure after letter C, on the first beat, I want a down bow from all of you—a strong down bow." He looked at the players in question. Most of them nodded.

"I will explain myself one more time. This is for two reasons. First, because that note begins a new phrase, it needs extra emphasis. Second, because I want you all to be seen moving in the same manner. If we have bows going in all directions, the audience, the patrons, will think that you are country bumpkins pulled in from the fairs." The glare he directed at them, while it might not have ignited the wood of their instruments, should certainly have caused them to warm up.

"Again. From letter C."



Franz started the orchestra again from that point. At the appropriate time, he focused on the viola section. He was gratified to find that they all followed his instruction. All but one, that is. One lone bow was moving up while all the others were moving down.

Cutting the music off, Franz set his baton down on the music stand. He said nothing, standing in silence. Within a moment, everyone in the great room was still. No one moved. No one whispered. It seemed no one breathed. When he finally spoke, more than one individual jumped, although his voice was not loud.

"Herr Vogler."

"Yes, Herr Sylwester?"

The violist's tone was not exactly impudent, but one would certainly not call it respectful.

"I am glad to see that you are not hard of hearing." It took a moment for that statement to sink in. Just as Vogler started to open his mouth for an angry retort, Franz said, "Tell me, Herr Vogler . . . why is it that fourteen other violists—even young Johann Amsel, here—can play that phrase perfectly, in exactly the manner that I desire, yet you seem to never be able to do so?"

"I . . ." Vogler sounded a little flustered as he stammered, "I simply think it sounds better the other way."

"You think it sounds better the other way." Silence. "Tell me, Herr Vogler. If the composer of this piece were here, would you argue with him about it?"

"But you are not the composer, are you?" Vogler's tone was rather pugnacious.

Franz was suddenly weary. "No, Herr Vogler, but I stand in his place. I direct you as the composer would have done. And if you will not accept my direction, then there is no place for you here." A moment of silence. "You are discharged."

Vogler's shock changed to anger quickly. "You cannot do that! I am one of Master Schütz's best musicians! Matthaüs, tell him. The master will be most angry."

Matthaüs shook his head. "No, Herwin. About the music, he is right and you are wrong. You are right that the master will be angry, but it will not be Herr Sylwester that will face his ire."

With an expression of stunned disbelief, Herwin turned to another and said, "Simon? Will you let this happen?"

"Herwin, I tried to tell you. This is your own doing."

Franz could see that Vogler's hands were trembling when he placed his viola in its case and snatched up his jacket. "I leave this place. You cannot discharge me—I quit!"

"As you will. Your pay will be waiting with Frau Haygood tomorrow."

Everyone watched as Vogler stomped out of the room, slamming the door behind him. All eyes then turned to Franz. He looked back at them, catching each eye for a moment. "Gentlemen, I say again, I stand in the place of all these composers, these men who will never be but whose genius is still before us. I will not accept less than your best. It is our duty, and their due. If you cannot bear that stricture, then it would be best if you left now." Long moments passed.

Franz picked up his baton. "Again. From letter C."

Grantville—May, 1634

The Thuringen Gardens was moderately crowded tonight, Thomas thought. The OF Band was playing tonight. This had brought many of their followers in early to take the best places. The old men were up on the platform, tuning up and getting ready to start any moment. As he watched, they were joined by a couple of their wives.

There were some tables still open. He and Lucas Amsel followed Masters Carissimi and Schütz toward a table.

Thomas was somewhat bemused by Master Carissimi's choice of attire. He had set aside the black cassock he sometimes wore, even though he was not a cleric . . . at least not yet. Thomas had heard him say from time to time that he was truly considering entering orders. When not wearing the cassock, Master Giacomo normally wore the culottes—knee britches—ruffled shirt and coat of a gentleman. Tonight, however, when he took the coat off and flung it over the back of his chair, Thomas was astounded to see him wearing a t-shirt.

T-shirts were almost ubiquitous in Grantville. They were seen in all sizes and colors, including many colors not found in nature. Master Tom Stone's tie-dyed t-shirt came to mind, which occasioned a shudder on Thomas' part. That shirt looked like a hangover felt, as far as he was concerned.

Many of the t-shirts had pictures or words on them. Variations on the American flag were common. Out of all that he had seen, Thomas had two favorites, one serious and one comical. The serious one had a long quote on it: "The only thing necessary for the triumph of evil is for good men to do nothing. - Edmund Burke." The comical one had a much shorter quote: "I'm with Stupid," above an arrow that pointed to the right. In some fashion, Thomas felt that those two shirts captured the essence of Grantville.

The t-shirt that Master Giacomo was wearing fell somewhere in between those two extremes, being simply a bright pink shirt with a picture of a plaza and surrounding buildings rendered on it in exquisite detail. Master Giacomo saw him looking at it.

"The Piazza Navona in Rome." He held the front of the shirt stretched out between his hands. "I have walked it before, many times. It reminds me of home. Remind me some time to tell you how I found it here in Grantville."

Master Heinrich looked at Master Giacomo, then at Thomas. "Tell me . . . do you know if Frau Amber is married? I have not seen a ring on her hand such as the married women of Grantville wear."

Thomas' eyebrows rose involuntarily. He looked at Master Giacomo, who replied, "I believe I was told that she was married back in the time before the Ring of Fire, but that she divorced her husband for adultery. His adultery."

"She never remarried?"

"I do not believe so, no. In any event, it would be a moot point now. As I understand it, the consensus appears to be that all spouses not in Grantville when the Ring of Fire fell will be treated as dead. That would mean Frau Amber should be considered a widow." Master Giacomo looked at Master Heinrich with the same curiosity that Thomas himself felt.

After a moment, Master Heinrich, obviously feeling the weight of their gazes, said, "She reminds me of

Magdalena . . . my wife. I find her . . . interesting."

Master Giacomo, Lucas and Thomas exchanged astonished looks. Before any of them could think of anything to say, the wine and beers arrived. Moments later, so did Signor Abati.

Andrea Abati had arrived in Grantville in December not long before Christmas. He was an acquaintance of Master Giacomo's, come from Magdeburg to visit the master and to learn more of the modern music.

Signor Abati was a *castrato*, or more politely, a *gentilhuomo*. This automatically made him a member of the musical elite of Italy. According to Master Carissimi, though, Abati was more than just a member of that group; he was the elite of the elite, probably the finest singer and musician of all the *gentilhuomi*. He was known as *Il Prosperino* among the patrons and musicians of Rome. The problem, from Thomas' perspective, was that Abati, at least when he first arrived, was fully in agreement with Master Carissimi's opinion. Despite the fact that he was taller than the Italian, Thomas had felt all too often during their first encounters that Abati was looking down his nose at all things German.

That had changed as Abati spent time with Marcus Wendell, Master Giacomo and Elizabeth Jordan. He had disappeared into the music libraries of the school and the various churches for days. From time to time, he would borrow a book from Master Wendell, only to return it in a few days and then begin to question everyone in sight about various issues until he had worked everything out and understood things—or at least as well as anyone in Grantville did.

Thomas had been around Abati quite a bit the last few weeks, particularly after Franz and the others had left on their trips. By that time, Abati had set aside most of his flamboyance. He was now so focused on the music that he rivaled Franz and Marla in intensity. Thomas quite approved of Abati these days. The thought surprised him somewhat.

"Good evening, friends." Abati plopped into the chair left open for him.

Thomas felt a moment of envy, for Abati's German was as melodious as his Italian. Then something registered with him at the same moment that Master Giacomo gasped. "Andrea, what have you done?"

"Oh, this?" Abati ran his fingers through his hair—his much, much shorter hair. "Yes, I have set aside the trappings of being *Il Prosperino*. I decided that to spend so much time on my hair and clothing was a distraction from the music. So, I simplified my life." Abati ran his fingers again through his wavy auburn hair again. It was no longer than the bottom of his ears, and his grin was almost salacious. "Then, when I let it be known that I wanted my hair cut, the proprietresses of the 'beauty salons,' seemed to almost come to blows over who would cut it. I finally settled on Frau Thelma Jean Agnes Jenkins at the 'Curl and Tan.'"

Abati paused long enough to give his order to the waitress. "I had at first thought of taking all my shorn locks and using them as favors for ladies in Italy to remember me by and for ladies in Germany to come to know me by." His grin was now several degrees past salacious. "But Frau Jenkins convinced me that I should allow her to sell them to a wigmaker. Even after her commission for the cutting and the sale, I pocketed more than a few coins."

"And your attire?" Carissimi quirked an eyebrow.

Abati shrugged a rather expressive shrug. "Long pants and a jacket. Life is so much freer, more comfortable. Velvet, of course. I have not given up all thought of style." His wine arrived as they were laughing. After taking a sip, he continued, "I got a pretty penny from the seamstress who bought all the

brocade, as well." Another grin. "I think they will use the former owner of the hair and clothes as a selling mark." More laughter.



Just then the performers on the stage all faced out, obviously ready to begin. The noise level in the room began dropping. Within moments, the man with the tambourine could be heard. "Good evenin', folks. I'm Huey Jones, and we're the OF Band."

One of the women stepped up and said, "That stands for Old Fa . . ."

"That stands for Old *Folks* Band." The man glared a mock glare. The woman smiled sweetly at him. "Anyway, we're goin' to get started with an old favorite, "She'll Be Comin' Round the Mountain."

The band started off, led by the mandolin. The patrons of the Gardens started clapping immediately. Seeing that no conversation was going to be possible for a while, Thomas and the others began clapping, too.

One song followed another. Thomas recognized several of them from his studies with Marla as being 'hillbilly' music, related to the country and western style. He decided the musicians on the stage were not the most polished he'd ever heard, but they obviously enjoyed what they were doing. Some of that joy communicated to the audience, who enjoyed both the music and the performers.

The final song ended to loud applause. The OF band waved goodbye as they stepped off the platform. Finally, the room returned to a state approaching normal, with a constant buzz of conversation in the background. The waitresses were scurrying around seeing to it that glasses and mugs were refilled.

"So," Giacomo said, "we were talking about Andrea before the music started. What are you going to do next, Andrea, besides break women's hearts and bankrupt the tailors of Rome? Have you learned all you came to Grantville to learn?"

"I have learned enough. I have not gained your depth of knowledge, Master Giacomo, but I have learned enough to know that the future is not here in Grantville. Yes, the archives of the future are here,

but the future is in Magdeburg. Musical archives are useless if they are not performed, so I will return to Magdeburg soon, to ally myself with Frau Marla and Herr Franz. I will support their orchestra. I will teach, I will sing, I will preach the new music to all who will listen."

Giacomo smiled. "My. Such fervor. And what has won your conversion to the cause, Andrea? Was it Frau Marla's recital in Magdeburg last year?"

"Oh, that opened a breach in the walls." Andrea laughed. "But it did not win the final submission."

"Then what did?" Master Heinrich asked.

"Opera."

"Opera?" It was a chorus from them all.

"Opera." Andrea was firm. "Oh, not the opera of Monteverdi, or Peri, or even yourself, Master Schütz."

"Then whose?"

"Verdi . . . one Giuseppe Verdi."

"An Italian," Master Heinrich snorted, smiling. "I should have known that only another Italian could have touched you so."

"You laugh." Andrea smiled in return. "But the man is . . . was . . . will be . . . what is the right word to say?" Frustration entered his voice.

"I believe most everyone has settled on 'was,'" Thomas said.

"Thank you. Verdi was a genius. His lesser works are wonderful, but *Otello* . . . *Otello* is divine. Words fail me." But not for long, Thomas noted. "And then there is *Boris Godunov*, by Muss . . . Mussorgsky. Who would have expected a master work from Russia? The pathos of it."

Andrea gulped his wine down, looking somewhat haunted. "God is indeed fond of irony. Be careful what you pray for, my friends. For most of my career I have prayed to find great music, genius music, music that only those such as I could appreciate." His expression was now bleak. "I would die to sing *Otello*, to sing that part just once before an audience. But unless God the Father works a miracle in my body, it can never be." He brooded for a moment more, then forced a smile. "So, I must do the next best thing. I must help raise up the men—and women; I do not forget Frau Marla, Master Giacomo—who can fulfill my prayer."

"And you begin in Magdeburg?"

"*Si*. I mean, yes. It is the capital; it is where the patrons will gather. It is where Frau Simpson's arts league is centered. So, I will go there and begin. Perhaps with Frau Marla."

"Indeed." Giacomo took a sip of wine. "I have told her to study with you. Her voice, it is golden, but there is still much I believe you could teach her. And, perhaps, you could learn somewhat from her."

Andrea nodded.

"As it happens," Master Heinrich said, "I will be going to Magdeburg soon. I have heard much of what friend Giacomo has told me, but I am an old head—I need to see it and hear it in practice. So, I will go to see Herr Sylwester and his friends build this symphony. I think then I will truly begin to understand the new music, deep in my bones. Would you care to travel with me, Herr Andrea?"

"I would be delighted, Master Heinrich."

Aschenhausen—May, 1634

"Well?" Joachim ben Eleazar looked expectantly at his rabbi, Shlomo ben Moishe.

The rabbi looked sidelong at his wife, Rivka who sat next to him with a stony expression. Then he sighed. "Yes, I will go."

"Good, Rav Shlomo." Joachim clapped his hands together. "Very good. I will make arrangements."

A small smile of triumph crossed Rivka's face.

Magdeburg—June, 1634

Franz set the baton down on his stand. "Enough. We will resume after lunch with the Vaughan Williams. You have two hours, gentlemen."

After he'd stepped down from the podium, he found Marla talking to several men in the back of the great room. One of them seemed somehow familiar.

"Herr Franz, how good to see you again."

Franz stopped short, almost stunned, raising his hand by reflex. "Herr Abati . . ."

Abati laughed as he grasped Franz's hand and shook it. "Yes, yes, I know, I look different. But we stand at the dawn of a new age, so I decided to follow your example." He waved his hand first at Franz's trousers, then at his shorter hair.

"But what are you doing here?"

"Why, I have learned what I could from Master Carissimi. Therefore, I have returned to Magdeburg to begin to practice it. Master Schütz . . ." Abati waved to another of the men talking to Marla ". . . was kind enough to transport me in his carriage. And here we are."

Master Schütz! Franz had once accidentally received an electric shock in Ingram Bledsoe's workshop. The feeling that ran through his mind and body at hearing the esteemed German master's name was much the same.

Grappling his wits together, Franz bowed. "Master Schütz, it is indeed an honor to meet you. I have heard so much about you from the musicians you so graciously lent us."

"Hmm, indeed." Schütz fingered his beard. "I suspect, Herr Sylwester, that if what I hear of you and your goals is true, that the honor is as much mine as it is yours." He stepped forward and offered his hand. "In truth, I marvel somewhat at your boldness, to attempt to craft that now which took two

hundred years to build in that other time."

Franz looked to Marla for a moment, then returned his gaze to the master. "I have no choice, Master Schütz. The music settles in one's very bones. It drives without remorse."

"Indeed," Abati murmured.

Schütz tilted his head and considered Franz for a long moment. "I believe I understand. You have my commiserations or my congratulations, whichever is appropriate."

Franz laughed. "On some days, it is both, but more often the latter than the former."

"Good, good. That is as it should be, then. Now . . ." Schütz smiled. "If I mistake me not, those musicians I have 'lent' you are about to descend upon me. I suggest you take your lovely wife and have your meal undisturbed whilst we have our reunion. I will endeavor to have them in their places at the appointed time."

* * *

Abati chose to accompany the others, leaving Schütz to face his men. They gathered around him, smiling. He called them by name and asked about their families.

Once the greetings were finished, he turned to where the four Amsel brothers were exchanging back-slaps and hugs. They immediately stilled when they felt his gaze. Matthäus sidled through the press to the front rank.

"Well?" Schütz asked.

Knowing full well what his master was asking, Matthäus responded, "The music is . . . different, Master Heinrich."

"Of course it is! But you can learn it, can you not?"

"Aye, master. We can, and we do."

Schütz fingered his beard again. "And Herr Sylwester?"

Matthäus looked around at the others, then back at his master. "He . . . it is very different, what he is doing . . . so many changes. But the more he leads us, the easier it is to both understand the music and understand his vision. He is . . ." The young man was obviously groping for a word.

"Formidable," his brother, Marcus, suggested.

"Yes, formidable." Matthäus seized on it. "He is formidable and unrelenting. He demands our very best. He accepts nothing less than that—his very words. But, he leads well, he is consistent, and he is fair."

Schütz nodded slowly, still running his fingers through his beard.

"He discharged Herwin Vogler," someone said from the back of the crowd.

"What?" Schütz frowned.

"The fool brought it on himself, Master Heinrich." Simon Bracegirdle stepped forward. "He started complaining on the first day and never stopped. He would not understand what was being taught. The new music distressed him. The thought of someone only half his age telling him that much of what he knew had to change in order to play the 'new music' . . . he would not accept that. Herr Sylwester talked to him, Matthaüs talked to him, I talked to him, all to no avail. He would not stop resisting Herr Sylwester's leadership. Truth to tell, I would have sent him packing long before."

Schütz looked to Matthaüs.

"He has the right of it, Master Heinrich. Herwin would not listen, would only half-heartedly play, would not even attempt to *hear* what Franz—Herr Sylwester—was trying to lead us to create." Schütz noted that Matthaüs was on good terms with young Sylwester, good enough to use his first name.

Dropping his hand, Schütz sighed. "So be it. I perhaps let Herwin hang on too long, but he was one of the first players I ever hired, and . . ." He shook his head, then looked at them all. "Is the work worthy?"

Nods from all over, and a surprising response of, "Yes, Master Heinrich," from Johann Amsel, of all people. As everyone looked at him, the boy's complexion reddened, but he stared back resolutely.

"Good, good." Schütz smiled, then his face turned stern. "And make no mistake, my expectation is the same as Herr Sylwester's . . . your very best. While you follow him, it is as if you follow me. Nothing less is acceptable."

"Yes, Master Heinrich," came from all corners of the room.

Magdeburg—June, 1634

"Stop."

Marla stopped singing at Andrea's command.

"You are singing from the wrong place," he said, straightening from his slouch against the wall and walking toward her. "The voice, it does not come from here." He pointed to her abdomen. "Your breath must come from there, but not the voice.

"Nor does it come from here." Andrea touched her throat. As she opened her mouth to speak, he waved a hand. "Yes, yes, I have read of the vocal cords. But they are not the voice.

"Think of a violin, please. You play a violin by taking a bow to the strings, yes? But does the voice of a violin come from the bow or the strings?" Not giving her a chance to answer, he continued, "No. The voice of a violin comes from the body.

"In like manner, your diaphragm . . ." He pointed to her abdomen again. "Your diaphragm is the bow, and your vocal cords are the strings. But they are not where the voice comes from. The voice . . ." He leaned forward and placed a fingertip on her forehead. "The voice comes from the head. You cannot be lazy. You must relax your throat. You must place your tone in your head; sing from your head at all times." He turned back to his wall.

"Again, please."

* * *

"Cellos, you must follow me here. You must swell this passage." Franz tapped his baton against the podium. "Start softly. Then, as the theme rises, crescendo until it crests, then diminuendo to the end of the phrase."

Franz looked at his orchestra. "Start at letter F."

The orchestra began playing. Franz led them on. At the passage in question he began swelling his pattern, all the while looking directly at the cellists.

"Yes, yes, yes !" he exclaimed as they responded.

Franz waved them to a stop at the end of the passage. "Very good, gentlemen. That was exactly what I wanted. Now, do it again to prove it was no accident.

"Again from letter F."

* * *

Marla quit singing at Andrea's grimace. "What did I do wrong this time?"

"Your breath support weakened." Andrea stalked forward. "You let too much air out when you sing." He poked her abdomen with a finger. "You must control your diaphragm better."



Discouraged, Marla looked away. That cool soprano voice, so disconcerting from a man, seemed so dispassionate and yet somehow could cut so easily. She blinked her eyes as they started to water, only to feel Andrea's fingers take her chin and turn her to face him. "Marla, how many years have you studied voice? Not just sung, but actually studied?"

She counted in her head. "Seven. From sixth grade to twelfth grade."

"For seven years of study, you are very good—exceptional. But it is not enough for you to be exceptional. You will be the first woman musician in the up-time model, so you must be the best. I will teach you, and though I may seem stern at times, it is because I, too, desire you to be the best."

Andrea looked away. "You will be my legacy, my progeny. It is only through you that I will live on in this world."

Marla straightened and took a deep breath. As she let it out, Andrea looked at her with a crooked smile. "So, you will learn to control your diaphragm better, yes?"

"Yes, Master Andrea."

Inner fires stoked, resolution stiffened, Marla opened her mouth and sang.

* * *

Heinrich Schütz watched as Franz rehearsed the orchestra. He was sitting in the back of the great room between Frau Marla and Andrea. He had been doing so on a regular basis, ever since arriving in Magdeburg. Today, it seemed as if pieces of a puzzle that had been tumbling around finally fell into place. "Yes. Yes. I begin to understand."

"Understand what, Master Heinrich?" Andrea leaned forward slightly to ask.

"I begin to feel what manner of beast this symphony is. I begin to understand how to write for it. Master Giacomo tried to tell me, but I could not see it, could not feel it, not even with those CDs that he played for me, not even with the band.

"But now, listening to the orchestra here, listening to Franz rehearse them, I begin to hear it in here." Heinrich pointed to his head, then his heart. "Perhaps Schütz can learn new tricks after all."

* * *

Franz set the baton down on the stand. He looked at each of the musicians, one by one, taking his time. "Gentlemen, we are ready."

The applause started when he stepped down from the podium. Matthäus was first to stand and clap, followed a bare instant later by Isaac Fremdling and Simon Bracegirdle.

Franz's heart swelled. He stood there blinking, feeling as if he could hardly breathe. As the applause rolled, he bowed to the symphony, then straightened and raised a fist in the air. Amid the cheers of the players, he shouted, "To the Glorious Third of July!"

Magdeburg—July 3, 1634

Lady Beth Haygood stood near the door to the great room, watching and greeting as notables arrived. It still seemed odd to her for a buffet and bar—or at least that's how she thought of them—to be present at a concert. But then again, she supposed it wasn't really any different from what she'd heard about the skyboxes at some of the football stadiums before the Ring of Fire fell. The wealthy and influential would always insist on having their comforts, it seemed. The wine table was certainly receiving a lot of visits, anyway. Since this was an afternoon event, the food table consisted mostly of what Lady Beth thought of as party foods: hors d'oeuvres of various types, finger foods mostly.

Mary Simpson had developed some pretty detailed plans for how this affair was to be conducted before she left on her trip, which it now seemed was indefinitely extended. Lady Beth wasn't sure where Mary was now. Wherever she was, Lady Beth was beginning to worry about her. Be that as it may, since

Mary wasn't here, it had fallen to Lady Beth to execute those plans. So, she had rolled up her figurative sleeves and done so.

Lady Beth thought Mary would have approved if she had been able to attend. With the help of advice from Eleonore Wettin, she had carefully crafted the arrangement of seating in the room, ensuring that every major noble house had its own block of seating which were marked off by ribbons of different colors. Then she had also carefully crafted the invitations, announcing the concert but also managing to let them know that this event would be somewhat different than anything else they had ever attended.

The response to the RSVPs had been almost unanimous. Anyone who was anyone and was in Magdeburg was attending. Lady Beth had been checking names off her mental checklist as they entered. More of them were arriving in very quick fashion. Apparently the hints that had been dropped that those who were 'fashionably late' would miss part of the performance had been taken to heart by most of them.

Lady Beth had to smile at the mixture of fashions she was seeing. Many of the older people were still wearing the styles that had been the equivalent of *haut couture* when Grantville appeared in 1631: wide skirts, bodices and high collars for the women; knee britches, long waistcoats and coats for the men.

Mixed in with them, however, were those who were trying to adapt some of the up-time styles. There were several women, mostly younger, who were wearing variations on the theme of the Empire style gown Marla Linder had worn for her concert last December. Most of them received passing grades from Lady Beth. *Great day in the morning.* The one coming in the door at the moment was way too short and stocky to wear that style. *She looks like a bowling pin!*

The young men had begun trying up-time influenced clothing styles some time before. Prime Minister Stearns—Lady Beth chuckled at the thought of Mike Stearns being a Prime Minister. *Lord help us all!* Mike had been their first example, but Signor Andrea Abati and his new mode had been like a rock in a pond. You could almost track the ripples of the style as you watched to see who talked to who when and who was wearing what next. It was a little more forgiving of physical makeup than the Empire style dress was, so most men were at least presentable in it. Signor Abati, of course, defined it. She had already heard several of the younger women—married at that—almost swooning over how romantic he looked.

And speaking of Signor Abati, there he was now with Maestro Giacomo Carissimi and Signor Girolamo Zenti. Lady Beth smiled at sight of that mismatched trio. They were all talking volubly in Italian, with waving of arms. She had grown quite fond of the maestro in Grantville. The other two, while they could be a bit outrageous—make that a lot outrageous, in the case of Signor Abati—were usually a lot of fun to be around.

The students she had drafted to serve as ushers were scurrying back and forth. They were leading people to their designated seats, making sure that everyone had a copy of the program, and collecting wine and plates of hors d'oeuvres for those who wanted them. The room was quite full, but there were still a few on Lady Beth's mandatory wait list who hadn't appeared yet.

Ah, there's one of them now. Master Heinrich Schütz was finally arriving, predictably accompanied by Lucas Amsel on one side. On the other side was . . . *Heavens above! That's Amber Higham!* Immediately all sorts of wheels began spinning in Lady Beth's mind. It was only a moment before a delighted smile broke out on her face. So, this was the man the few faint rumors from Grantville had attached to Amber's name. Good for her. It was time she started taking a little more interest in life. From all accounts, it was past time for Master Heinrich to do so as well. She waved to them, and Amber waved back.

It was but a matter of moments later that Princess Kristina and her companion, Lady Ursula, came through the door, followed by Wilhelm and Eleonore Wettin. Lady Beth mentally ticked them off of her list. She moved forward to greet them, then handed them over to the ushers to be led to the royal seating.

*Finally!*The last name on her list, Don Francisco Nasi, appeared with his guests. Once they were seated, she beckoned to one of the ushers, gave him a message, then took her husband's arm and headed for their seats in the royal space. One of the perks of managing the affair, after all, was selecting your own seats.

* * *

Franz watched from the side doorway as the screens that had masked the orchestra area from the rest of the great room were moved by the ushers. The orchestra had been seated for some time, their quiet talk and occasional notes masked by the roar of conversation happening in the main part of the room. They had lost three more players besides Herwin Vogler for various reasons, but the orchestra still numbered more than fifty-five string players, which was an amazing experience for them all. The largest orchestra Franz had ever heard of was the group that Master Heinrich had sent, some nineteen in all, but that had included at least four wind players. Tonight was going to be a first in the experience of everyone, performers and listeners alike.

Not for the first time, Franz wished they had a proper performance hall, like those he had seen in some of the videos that Marla had shown them last year. It frustrated him that for the first symphony concert they were having to make do with the biggest room they could find, which was not at all what he wanted.

Taking a deep breath, he banished those thoughts from his mind. He turned to Matthaüs Amsel. "It is time."

Matthaüs, who was serving as concert master, nodded. They shook hands, and Matthaüs walked out the door.

Marla drew him away for a moment. She never said a word, simply took his hands in hers, smiled, and kissed him. Still smiling, she turned and walked down the hall. Franz had to force himself to turn back to the door.

Matthaüs had reached the front of the orchestra. There was a smattering of light applause, as those who did not know what to expect responded to his appearance. Matthaüs properly bowed to acknowledge the applause, then turned to the orchestra. Raising his violin, he sounded an A to lead the orchestra through the final tuning exercise. Once that was completed, he took his seat at the front of the violins.

There was a long expectant silence.

Franz felt a tension in his gut that was starting to build, a flame that was starting to burn. He checked for the fifteenth time to make sure the baton was still tucked up his left sleeve. Taking another deep breath, he stepped through the doorway and strode to the front of the orchestra. The applause was louder this time. He bowed to acknowledge it.

Turning, Franz stepped up on the podium and slid the baton out of his sleeve. Holding it before him in both hands, he took one slow look around the orchestra. All eyes were on him, awaiting his direction. Unsmiling, feeling the heat rising, he slowly lifted his hands. The instruments were raised to position, bows were poised. As the tension crested, he began.

* * *

Marla stepped into the back of the great room just as Franz straightened from his bow. She moved to one side, where a chair had been placed for her. One of the ushers held it for her as she sat. She rewarded him with a smile, only to see him blush.

Facing forward, she could see Franz with his arms raised. She held her breath, waiting for that first moment, the first public performance of Franz as a conductor. It had been a long road for him to get here, over three years in the traveling. Three years to go from crippled, embittered ex-musician to a leading light in the music of Germany. Well, soon to be leading light. She smiled. Today would light the flame.

The baton moved. The music began.

* * *

Giacomo Carissimi closed his eyes, the better to drink the music in. The *Brandenburg*—no, the *Vasa Concerto No. 3 in G major* by Johann Sebastian Bach. He and Andrea had nearly exploded with laughter when they had seen that listing in the program. The reasoning behind the renaming of the work was immediately obvious, but it was still a delicious thing to savor. This was a slap in the face of the Elector of Brandenburg, into whose employ Andrea had nearly gone. It was perhaps even the more savory because the Elector had yet to realize he had been slapped.

This concerto was one of the first up-time pieces that Giacomo had truly grown to love. Two driving allegro movements, linked by a bare two measures of an adagio movement. The last movement was absolutely one of the most joyous pieces of work that a string player could perform. The themes were passed from part to part as if it were a musical version of a child's keep-away game. Giacomo remembered reading that old Johann—which was how he affectionately thought of him—liked playing the viola. He could believe that, hearing this piece. The viola parts were just as intricate as the violin parts.

He abandoned himself to the music, immersed in it until the final chords.

* * *

Heinrich Schütz nodded slowly as the *Vasa Concerto No. 3* concluded. Young Franz was indeed shaping to be what Master Giacomo had described him to be—a musician who played musicians. There was no doubt that the fifty or more musicians were gathered in his hands and played as if they were extensions of his fingers. To hear this—here and now—made up for the turmoil he had suffered weeks ago. This was the future. This was what music would look like from now on. Patrons and musicians alike would never settle for less after this. Historians of music would look back on this day and say, "Here. Here is where it changed." He marveled to be here, to be part of it in some way.

The program stated that the next work was by one Johann Pachelbel. Another name he did not know, so obviously one from the future. A *Canon in D*. Good, it would be a form he was somewhat familiar with, then. Perhaps from not so far in the future.

The baton was raised. Once more music sounded.

The canon started quietly, a slow statement of the theme in the cellos, and then began to build, phrase by phrase, theme by theme, section by section. It was light, it was airy, it floated. Heinrich floated with it. It almost seemed like musical lace, he thought. He admired Herr Pachelbel's delicate touch at writing the music. He also admired Franz's equally delicate touch at leading the performance of it.

The music built and swelled, ebbed and flowed. Finally, it began a slow diminuendo. The concluding

phrase was a final quiet restatement of the first theme.

As the applause swelled around him, Heinrich nodded. *Yes. This is the future and I will—I must—be a part of it. My name will be known for more than the music brought back with Grantville. God willing, I will make my place. And a far different one it will be than that of that sad man I read about in the encyclopedia article.*

* * *

Andrea Abati, an old hand at reading programs—this was his second—glanced at it quickly to see what the third work was to be. Hmm, *Adagio for Strings*, by Samuel Barber. An Englishman, or more likely an American with an English name. This was not one of the men he had read about in his weeks in Grantville. Nor had he managed to hear this one in rehearsal since he returned to Magdeburg. Nonetheless, he trusted that Franz Sylwester had selected only superlative pieces for this concert. Certainly, the first two works had been excellent. *Ah, Franz has raised his stick, or baton, as Master Giacomo called it.* Andrea sat back in his seat, anticipating.

The beginning was very quiet, even more so than that of the canon. The sound seemed to seep into the room, a moving line over suspended chords. The theme was minor in intonation. It evoked a sadness in Andrea's heart, especially when it was joined by another line in a very free polyphony over the chords. He began to hear it as a mournful aria, perhaps as a mother crying for her children.

The music tore at him, shattering the walls he had built in his mind ever since he had read the future's judgment of him and his brethren. All the glory and the beauty of his art, of the music created by the *gentilhuomi*, treated with pity, sadness and more than a hint of condescension. He was used to men in Italy and Germany considering him unnatural, but that the future judged him so . . .

The orchestra sang, a song without words. Andrea poured his grief out into the music, letting the dark places in his soul flow, the grief in his heart matched by the sorrow of the music. How . . . how did this . . . American, this . . . up-timer—how could he know of Andrea's sorrow? How could he write this, this *passion* for Andrea Abati and his brothers, when he never knew them?

The cellos picked up the theme and carried it, sounding darkly, then restated it, climbing, climbing, joined by the other strings, sounding now as a choir of angels mourning. Andrea listened, heart swelling, as the music crescendoed, circling, climbing, carrying him along, building, building, building, building, one peak after another, until it finally crested. His mouth opened in a silent scream, every muscle in his body clenched, every tendon rigid.

The music stopped.

Slowly, slowly, it began again. In his mind's eye he could see the mother laying her child down. So, as the orchestra sang the final lament, he, too, laid down the grief he had not even realized he was carrying.

When the final note was released, Andrea opened his eyes, unsurprised that they were teary, unsurprised that his cheeks were wet; unsurprised that he was shaking a little.

Master Carissimi leaned over. With concern in his voice, he asked, "*State bene?*"

Andrea took a moment to respond. "*Si.* I am all right." And as he smiled at the master, he realized that he was.

* * *

Franz turned, stepped off of the podium and bowed to acknowledge the applause. He then walked out of the room to allow for the small intermission that was planned in the program.

He leaned back against the wall in the hallway and wiped the damp hair out of his face . . . or at least, he attempted to. Realizing that he still held the baton in his hand, he tucked it back into his left sleeve, then completed the action with his hair.

"Franz!" Marla hurried to him. She arrived with a thump, threw her arms around him and gave him a ferocious hug and a kiss that left him dazzled. She stepped back at arm's length. "It's going great, Franz! It sounds wonderful, the guys are playing wonderful, and you're doing wonderful!" She hugged him again.

"But the hardest part is yet to do."

"Bah! What's left may be longer, but I think the hardest one was the Barber, and you did fine with it."

Franz contemplated her words, and a sense of warmth began to build. She was right, he thought. The Geminiani/Carissimi piece was relatively simple, and the Vaughan Williams, although longer, was no more complex than the Barber. A new feeling of confidence settled on him.

* * *

Thankful that the third work was completed, Girolamo Zenti picked up his program. He stared at it without seeing it for a moment, settling his mind. The *Adagio* had been a little disturbing; dissonant, even harsh at times, yet it had in some way moved him. A sudden chill chased through him; he shuddered.

Focusing on the program, he saw that the next work was the piece that his friend Master Giacomo had contributed to the program, *Variations and Etude on Geminiani's Concerto Grosso in E minor*. Although not a musician himself, Girolamo perforce had to know something about music in order to be the master craftsman that he was. He found his friend's work interesting. He had taken a work originally written for a group of solo instruments and harpsichord and had re-voiced it for full orchestra.

There was a stir as Franz walked back to the podium, once again bowing to the applause. Girolamo settled himself to listen.

The initial movement was a largo, played slowly. The principal theme was built around a dotted, almost syncopated, stuttering rhythm. The cellos played a strong ground line, the other parts layering above them. He looked over to see Master Giacomo nodding, a small smile on his face.

An allegro with a fast triple rhythm followed. The violins were prominent. Girolamo found his foot tapping. It sounded something like a song he used to hear at the harvest festival in his home town.

In the following adagio, the sections entered one by one over the sustained cello notes. The movement was marked by the descending figures of the first violins in the opening bars and the ascending chord of the violas in the final measures.

The final movement, another allegro, was the most complex. The violas assumed prominence in it, first using an imitative violin entry and triple stopped chords, then using contrapuntal entries that were answered by the first violins, the seconds and, finally, the cellos.

When the piece concluded, he leaned over to Master Giacomo. "That was nicely done."

"In comparison to the others, it is not so much." Giacomo smiled amidst the applause. "But it does

provide a bit of a comfortable sound, does it not?"

* * *

Matthäus rested his violin on his thigh, glad for the brief break. They had done well, he thought. Franz had prepared them well. In return, they had proven their mettle for him.

The climax of the evening was at hand. The piece they were about to play, while not as jarring as the earlier *Adagio*, could almost have come from the same school. It definitely had its intense moments, as well as being considerably longer. He was to play the lead violin part in the quartet in the central portion of the work.

Striving to focus, to not let down, Matthäus took several deep breaths. Feeling a little calmer, he looked to Isaac Fremdling who sat next to him and was to play the second violin part in the quartet. Isaac was looking back at him. They shared a brief smile before looking to the podium where Franz stood.

* * *

Franz looked down to where he held the baton in both hands. He took a deep breath and uttered a brief prayer before he reached inside himself and opened wide the door to the fire that burned within. As the flames roared forth, he raised his arms and began the *Fantasia on a Theme by Thomas Tallis* by Ralph Vaughan Williams.

* * *

From the opening movements, the brief introductory theme, everyone in the room was captivated. The musicians were the most enthralled, but even the most casual listener was caught up as pure musical passion seemed to fountain from the orchestra. Flames of music seemed to wave from the baton of Franz Sylwester, seemed to sometimes erupt from his figure as he reached out with his crippled hand and molded the flow of the themes.

* * *

Never, never before had Franz felt so much at one with a work. He became the music, bending, gesturing, flowing from one sound to another, leading the players in the great dance, evoking more from them than they—or he—had ever dreamed could be drawn out of them. God Above, if this was anything like what Lucifer had felt while leading the choirs of angels in praise, no wonder he rebelled!

* * *

Marla was frozen. All her being, her very soul poured out in response to what Franz was shaping, the glory of sound that was coming forth from the players. Unnoticed, unbidden, tears flowed.

* * *

Tears also glittered in Andrea's eyes. He felt lifted on wings as the *Fantasia* poured into those places that the *Adagio* had scoured clean, filled him and provided a healing balm. Andrea had often joked of singing like an angel. Now he felt surrounded by them.

* * *

Heinrich Schütz was stunned. He had heard this work in rehearsal, but to hear it now, performed flawlessly with such an overwhelming passion, was almost unbearable. All he could do was whisper over and over again, "My God, my God."

* * *

Giacomo Carissimi sat, eyes closed and a beatific smile upon his face. Such must have been the song in Heaven when the world was created. He whispered, "*Soli Deo Gloria*."

* * *

The music ebbed and flowed, now cresting, now receding, now brighter, now darker. Through it all, Franz moved like a beech in the wind, still leading, still calling forth just that little bit more of passion from the musicians, just that little bit more of fire that surprised them, imbuing even the softer passages with intensity.

As the *Fantasia* drew to a close, Franz gently led them to the final chord. Sustaining the tone with his baton, he held his left hand up, then began to lower it, bringing the players into a gradual diminuendo. Finally there was only a thread of sound left. He closed his fist, and it stopped.

* * *

There was a moment of absolute silence.

Applause erupted. Everyone was on their feet, clapping. "Bravo, Bravissimo, Bravo," was heard loudly over and over again from the Italian sector of the room. It was picked up by others. Shrill whistles could be heard every once in a while.

Franz put the baton down on the stand and stepped off of the podium. He kept one hand on the music stand, however, because his knees were so wobbly he was a little uncertain he could bow without falling. He was successful in his bow, though, and in the several that followed.

Straightening from the third bow, he stepped to one side and waved to the orchestra, motioning them to stand. Matthäus looked at Isaac. They both shrugged. As they stood, the others followed. After a moment, Franz stepped back onto the podium, holding his hands up for quiet. It took some little while, as a couple of rowdy Italians were still shouting, but he finally achieved it.

Before he could say anything, Odelia Seiler, Georg's little girl, jumped up from a seat in the royal area and trotted forward. Franz looked at her in bemusement. She stopped in front of the podium, gave a curtsy, then offered him a white rose from behind her back. Startled, he reached for it. When his fingers touched it, he began laughing. It was brass! Franz knew exactly who had put Odelia up to this . . . this was 'payback,' as the Grantvillers called it, for his offering Marla a brass rose at her concert in December.

Odelia trotted back to her seat as he made a show of sniffing the flower, then tapped it with a fingernail. Chuckles sounded from the audience, most of whom were present when he started the joke. Finally, he set it aside.

"We. . ." Franz extended his arms to include the entire symphony ". . . want to thank you very much for coming to this, the first concert of the Magdeburg Symphony Orchestra. These men have come together, many of them strangers to each other, with one goal: to perform the best music that can be found. They have worked very hard in the last three months. They, more than I, are deserving of your applause." He led the audience in another round of applause.

Holding his hands up again, he received the desired quiet much quicker than before. "I realize that we have reached the end of the printed program, but we have a small surprise for you. Please, be seated."

Stepping down from the podium again, Franz went over to the door to the hallway. Marla was waiting, eyes gleaming. Taking her by the hands, he asked, "Ready?"

She squeezed back. "Ready."

As they appeared hand in hand, the audience began clapping again. They stopped in front of the podium and bowed together. Franz stepped onto the podium and picked up the baton. Marla stepped a little to one side and turned slightly so she could see Franz. He looked at her; she nodded. Raising the baton, he began. After a short introduction, Marla poured out her voice.

*And did those feet in ancient time
Walk upon Deutschland's mountains green?
And was the holy Lamb of God
On Deutschland's pleasant pastures seen?
And did the countenance divine
Shine forth upon our clouded hills?
And was Jerusalem builded here
Among those dark Satanic mills?*

Heinrich and Giacomo were struck by the power of the song, the power of the text, but even more so the power of Marla's voice. Andrea, on the other hand, simply smiled. He had known what was coming. The sheer beauty of Marla's singing was the perfect cap to the concert in his mind.

The orchestra played an interluding instrumental verse. Marla opened her mouth again.

*Bring me my bow of burning gold,
Bring me my arrows of desire!*

The tempo of the music slowed a little. Marla's performance became slightly more deliberate.

Bring me my spear! Oh, clouds unfold!

Her voice swelled and crested in the second part of the line.

Bring me my chariot of fire.

She held up her hand to the heavens. More than one person wouldn't have been surprised if she had been answered.

*I will not cease from mental fight,
Nor shall my sword sleep in my hand,*

Marla sang no louder, but the intensity grew.

*Till we have built Jerusalem
In Deutschland's green and pleasant land!*

The orchestra played the final concluding chords. Franz was watching Marla, and they cut off together.

Once more applause resounded within the room. Once more shouts of "Bravo! Brava!" were heard from some irrepressible Italians. Once more Franz and Marla joined hands and bowed, then separated and waved to the orchestra. Finally, they joined hands again and bowed one last time before leaving the room.

* * *

Once the applause died down and the patrons began to mill around, Franz and Marla quietly re-entered the room. They spent some time among the jubilant musicians. Franz congratulated everyone, gave them two days off, and told them to report to rehearsal on the following Thursday.

Franz carried his white 'rose.' Accompanied by Isaac, Simon, and Matthäus and his brothers, he and Marla began to mingle with the audience. Congratulations were showered on them from left and right. Franz's bemusement returned when he was asked to autograph programs. Isaac had a pencil in his pocket, which turned out to be very convenient.

After a few minutes, they encountered Master Heinrich and Amber Higham, who were wearing bemused expressions of their own. Lucas Amsel was with them, and he was not only not bemused, he was so excited he was about to burst.

"Matthäus! Marcus! Johann! Simon! You will never guess what has just happened!" Without giving them a chance to even begin to guess, Lucas blurted out, "Princess Kristina just asked Master Heinrich if he would become the *Kappellmeister* for the court here in Magdeburg."

Exclamations of surprise and joy sounded all around. Matthäus turned to his master. "Did you accept, Master Heinrich?"

"Well . . . um . . . actually, I asked them for a little time to think about it."

Exclamations of surprise and "What?" sounded all around. Amber Higham said, "But he's going to accept it, aren't you, Heinrich?"

Master Heinrich shrugged, but a small smile playing about the corners of his mouth told the truth.

Franz and Marla congratulated him. They wandered on, Isaac in company, speaking to all and sundry, until suddenly Isaac stopped. "I do not believe it."

They looked in the direction of his gaze. Don Francisco Nasi was approaching with three older people; two men and a woman. They wore the Jewish mark on their clothing.

"Ah, good day to you, my friends." Don Francisco's voice was expansive. "A remarkable event, yes. Truly remarkable."

Franz and Marla thanked him. All the while Isaac stood as still as a statue, staring at those who accompanied Don Francisco.

The taller man, who had a truly impressive beard, stared back until he was forcefully nudged by the short woman who stood beside him. He looked at her, then looked back at Isaac. Finally, he spoke. "Yitzhak, is it well with you?"

Isaac opened his mouth, but nothing came out. He closed it, coughed, then squeezed out, "Yes."

"Good, good." The older man nodded. "It is mostly good with us. It could be better, but it is good enough that I cannot complain." He fell silent, still nodding, only to receive another nudge from the woman. His look to her this time was a glare, which seemed to have absolutely no effect on her.

Franz and Marla watched in fascination.

The man spoke again. "Er . . . Yitzhak . . ." He hesitated, then finished in a rush. "Will you come home to us?"

Isaac turned white, starting to waver. Franz reached out and grasped his elbow to steady him.

The other man looked concerned. "Yitzhak, I have wronged you. I . . . was so certain that I was right in my plans for you. I was furious when you would not obey me. I was blind to see that I could not make you be anything other than what the Holy One, Blessed be He, had shaped you to be. I thought you were rebellious, and on that night . . . I was infuriated. I said words that no father should say to a son." The man, obviously Isaac's father, looked down at the ground, then back up with an earnest expression on his face. "As the greater fault was mine, I acknowledge that fault. I ask your pardon." He opened his arms. "Will you be restored to your family, my son?"

Isaac was trembling under Franz's hand. Slowly, he moved forward. Then, with a sudden rush he fell into his father's arms. "Avi, Avi."

His father folded his arms around Isaac in a fierce embrace, closed his eyes and bowed his head to lean against his son's, whispering softly to him. The woman, who must have been his mother, smiled a tender smile and rested a hand on Isaac's back. The other member of the group exchanged a smile of satisfaction with Don Francisco.

After a moment, Isaac straightened and pulled away. "My friends, I would like you to meet my father, Rabbi Shlomo ben Moishe of Aschenhausen, my mother Rivka, and Joachim ben Eleazar, the president of our community. Father, these are my very good friends, Franz Sylwester and his wife Marla."

"So," Rabbi Schlomo said. "You are musicians, yes?"

"That's right, sir," Marla replied.

The rabbi looked surprised at her response, but cleared his throat and continued. "Is my son a good musician?"

"Absolutely, sir." Franz smiled. "One of the best."

"Good, good." Rabbi Shlomo turned to Isaac. "But you should *be* the best, *nu*?"

Isaac laughed. "Yes, Father. I will try harder."

* * *

Franz watched as another stranger approached. The young man had diffidently entered the room after the concert was over and hovered around, walking a few steps one way, then back. After talking to one of the ushers briefly, he had focused on Franz, once or twice starting toward him but then pulling back. Franz judged him to be about thirty, maybe a little younger. He was dressed reasonably well, but certainly not as a member of the *Hoch-Adel*. He was now obviously determined on talking to them, so Franz stopped and waited for him.

"Good day, Herr Sylwester."

"Good day."

"I have heard of your offer for musicians, and I have come to find a place with them, if I may." The man stood straight, and looked Franz in the eye.

"There are a few places left. Where are you from, and what do you play?" "Most recently from Schweinfurt, although I have played in several of the towns of Thuringia. As to instruments, I play all of the common stringed instruments with some level of skill, but my best is the king of instruments, the organ."

He certainly seemed to not be burdened with false modesty. On the other hand, there was no air of braggadocio . . . he apparently was reciting what he considered to be fact. Franz could accept that.

"And you are?"

Now the stranger was flustered. "I am sorry; I have left my manners at home. You must think me very rude. My name is Bach, Johann Bach."

Franz and Marla looked at each other, and smiled.

NONFICTION:

What's For Dinner: Typical Dishes From 1632.

Written by Anette Pedersen



The common dishes in 1632 were quite different from what most western people eat today, and the following article will try to show what would have been prepared and served in the household of a moderately prosperous craftsman—say a printer or a blacksmith—in central Germany. In other words, what an American in the 1632 universe is likely to encounter if staying with a prospective business partner. The largest part of the population—the farm-workers and poor farmers—would have eaten only those dishes served to the servants in the household, while the wealthiest merchants and nobility would have dined exclusively on the richest dishes, but by choosing a middle-class household it should be possible to show the widest possible range. Most of the recipes are direct translations from a

contemporary cookery book by Anna Wecker, the wife of a doctor from Colmar in Alsace, with some added explanations and comments based on other sources. That few attempts have been made to tell the quantities of the various ingredients is according to the custom at the time.

* * *

A household like the one described above would most likely consist of :

The craft master, in charge of the business,

The wife, who oversaw the household, was responsible for everybody's food and health, and did most of the shopping,

The children, who would have chores either in the business or in the house,

An older relative or two, who would be expected to do however much they could of the mending, repairs and other light work,

An unmarried or widowed sister or female cousin, who would share the housewife's work-load and probably be in charge of, for example, sewing, mending, washing and ironing all the linen and clothes of the household,

Two or three journeymen, and one or two apprentices, all working in the business and living in the house,

Two or three maids, to do the large amount of cleaning needed in a house with open fire-places and no modern cleaning tools or running water,

A cook, to plan the logistics of the meals together with the housewife, and cook the ten to twenty dishes served every day,

Two or three kitchen girls or boys, to do the scullery work, help the cook, and stir and turn food on the fireplace,

One or two male servants, to do the heaviest work such as chopping firewood for all heating and cooking, and for carrying every drop of water needed for cleaning, cooking and bathing into the house from whatever well had water.

All in all, this would be a household of 15-20 persons, most of whom were employees and all of whom worked hard.

If the household was old-fashioned for its time, the meals would be served to everybody at the same big table, but with different dishes placed at the high end—for the family—and at the low end—for the servants. If the household was more modern, the meals would be served at two separate tables with the family eating first, and the leftovers being passed on to the servant's meals together with an extra pot of something cheap and filling like stew, porridge or gruel. In either case, it was possible that the kitchen staff ate separately from the other servants and had a bowl of stew, soup or porridge while cooking the other dishes, and then picked over any remains of the meals after clearing the tables.



The two main meals in a 1632 household were served by placing the food on the table in sets or courses, each consisting of several dishes, but how many dishes per course and how many courses would vary with the status and prosperity of the household. For a household of the size here presented there would have been four to six dishes for the family in addition to the bread and beer. These dishes would all have been placed at the table at the same time or, if a second course was served, it would just have been some sweets, nuts and firm cheese. For the servants there would most likely be just a stew, or else porridge or gruel with a side-dish of boiled salted meat or herring in addition to the bread and beer.

1632 was in the middle of a major change in food fashion. The medieval ideal food—often dark in color, sweetened and with as many spices, as much meat and as few vegetables as you could afford—was slowly being replaced by a new French style—often pale in color, and with few spices and as many of the newly developed Italian vegetables as you could afford. In the German manor houses this change would have taken place by 1632—unless the owner was very old-fashioned—but in a middle-class household the preference would have been for the old-style food, and something like braised lettuce or fried celery would be considered more of a novelty than a treat.

* * *

Beer and bread would have been served to everybody at all meals, but the family and guests would get strong beer and wheat or fine rye bread, while the servants would drink small beer and eat a coarser rye bread. These two major food items could be either bought or produced in the household, and how they were made has been described in other articles.

In a household where every morsel of food wasn't automatically eaten, there would often be bread slices and beer left when the tables were cleared, and unless they—and other leftovers—were either donated to the poor or given to the servants to sell, they would be used as a kind of porridge.

BEERBREAD

Soak leftover bread in cold water overnight, drain off the excess liquid and press the bread through a sieve. Add enough beer to create a porridge consistency, and boil until thick and smooth. Serve with honey and cold cream or milk. Comment: If served in a wealthy household spices could be added.

Beerbread was most common as a breakfast dish, but gruel and porridge made from barley, oat or dried peas formed the base of all the three daily meals. Porridge, in many households, would be all the servants would get to eat along with bread, beer and leftover meat dishes from the family's meal.

BARLEY GRUEL

Soak whole or cracked barley grain overnight in cold water. Rinse it in the morning and bring it to boil covered with fresh water until the water is reduced to half and the grains are tender. Comment: If this was also served to the family, washed raisins, honey, mace and white wine could be added.

Before the potato became common, it was the winter-hardy kale, that kept the population healthy, and this—now all but forgotten—dish was the most common of all winter dishes.

KALE GRUEL version 1

Carefully clean and chop fresh green kale. Cover it with water and boil until tender. Other vegetables and a piece of salted or smoked pork may be added. Once cooked, remove the meat and thicken the kale soup with oat meal or barley flour.

KALE GRUEL version 2

Soak barley grain overnight, and bring to a boil in water with finely chopped onion. Add finely chopped kale and simmer until it is all soft. Add butter or fat.

APPLE GRUEL WITH PORK

Soak a piece of salted pork, and boil it until tender. Sieve the soup, and add crushed oats, chopped leeks, bay leaf, and some thyme. Add fresh or dried apples, and cubes of the boiled pork, and boil again before serving. Comment: If this dish was also served to the family, the soup might be spiced with ginger, and the pork fried before being returned to the stew, perhaps along with some dumplings.

PEASE PORRIDGE

Soak the dried peas for 1-2 days. Rinse carefully, and pick out any bad peas by placing each handful on a plate. Boil for a long time until the peas are tender. If the skins of the peas are very tough it helps to add lye to the water. Press the drained peas through a coarse sieve until only the skins remain. Leeks, carrots, or parsnip may be added during the last part of the cooking. Comment: If the peas are served as a thick mush, fried chopped onions and cubes of salted or smoked pork may be sprinkled on top. If the peas are served as a soup, apple pieces and herbs such as parsley or thyme may be added.

* * *

In addition to the basics of beer, bread, and gruel all three daily meals would also contain some kind of protein—at least for the family. If the business was prosperous, the servants would also receive some kind of protein.

For breakfast the protein could be sausage, cheese or cold boiled meat from the day before spread with mustard or another condiment and placed on a slice of bread, but a hot side-dish of fried salted herring, black-pudding, or the meatballs known as faggots would also be common.

FRIED SALTED HERRING

Soak salt-preserved herrings in water over night. Clean out any remaining blood and remove the head. Dip the fish in a batter made from rye flour mixed with beer, and fry in lard until crisp. Comment: This was eaten by biting the meat off the backbone, or dipping the fish in sweet mustard and just crunching everything.

BLACK PUDDING

This boiled sausage—made from stirring the fresh blood from a butchered pig with oat meal, raisins and bits of lard—would be cut into slices, fried and served with apples cooked with vinegar and honey.



FAGGOTS

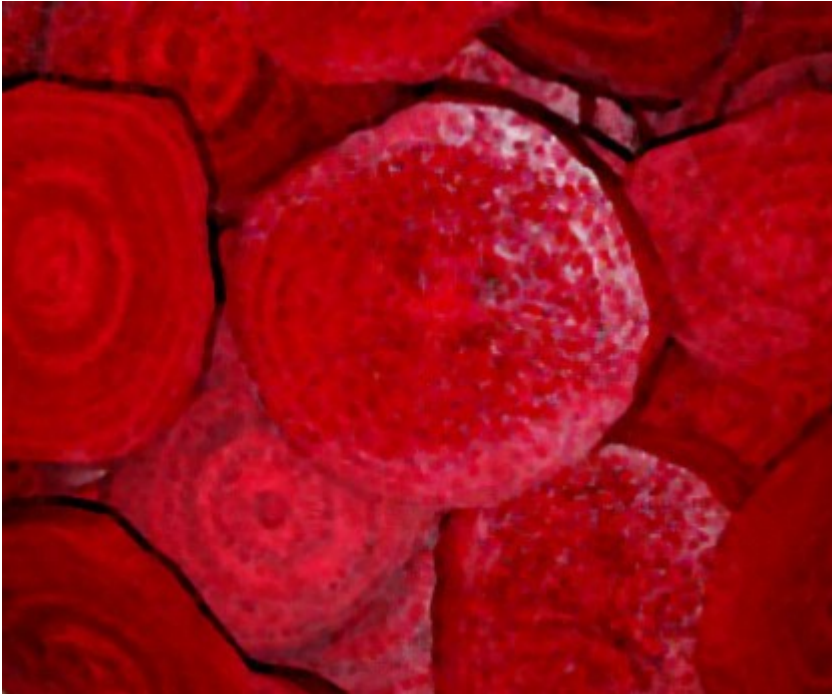
At the time faggot could mean either a bundle of kindling for the oven, or a mix of pork meat, liver and organ meat finely chopped, pressed to balls, fried and preserved in a jar sealed with a layer of fat. When served the balls would be removed from their protective fat seal, heated and served with the porridge or mashed peas plus pickled beetroot and/or mustard.

MUSTARD

This, the most common condiment, could be bought in several versions at the apothecary, but many households preferred to buy the black or yellow seeds whole and make up the large batches needed in the house. This was often done by placing the seeds in a big clay bowl along with a cannonball. The bowl would then be placed on somebody's lap, and the mustard seeds would be crushed by moving the thighs to make the ball roll, while the person did other work with his or her hands. Once the seeds were finely crushed, the ball would be removed and the mustard mixed with water, oil, vinegar, honey or cream depending on the wanted taste and texture. Unless cream was used, the mustard would keep as well as modern mustard.

APPLE SAUCE

The second most common condiment would probably be an applesauce made by cooking apples and onions in beer or wine, and then thickening the sauce with grated bread before pressing it through a sieve. For serving to the family the sauce could be spiced with cloves, cinnamon, and nutmeg, and made sweeter with honey or sweet wine syrup, but the basic version would be used by the servants to vary the flavor of their salted meat and porridge. This condiment doesn't keep well, and was usually freshly made.



PICKLED BEETROOT

Boil beetroots until they are tender and remove the skin. Cut to slices if the roots are big. Place in a glazed jar with spices such as peeled and chopped horseradish, caraway seed, mustard seeds, dill seeds, cloves or cinnamon, and cover with vinegar or vinegar and sour beer. Comment: These roots could keep for a year.

PEARS IN MUSTARD

A less common condiment, but one that's still used in the area of Hanover, was made by boiling the firm bergamot pears in apple juice or cider until tender. The pears were then removed, and the liquid concentrated to a thick syrup by boiling. Finally the pears were returned to the syrup along with as much mustard as was wanted. These preserved fruits could keep for months.

* * *

In a craftsman's household the biggest meal would be in the middle of the day, and in addition to the basic beer, bread, and gruel or porridge there would also be several protein dishes, both warm and cold, fish and meat. For the servants the protein would most likely be limited to a platter of boiled, salted pork, beef or mutton or a few salted herrings, but for the family there would be 3-4 carefully prepared dishes with meat or fish, probably in a sauce, possibly in a pie, as well as something sweet such as baked apples. During the summer there might also have been a vegetable dish or two for the family—the same if any version of Lent was kept.

Meatless days during Lent or on certain days of the week were not limited to Catholic families, but were considered spiritually cleansing by all faiths, so fresh and salted fish would remain in demand regardless of the changing politics.

PICKLED EELS

Carefully clean and skin the freshly caught fish, and cut to finger-long pieces. Sprinkle with a bit of salt, dredge in wheat flour, and fry until golden in butter or olive oil. Let the fish get cold. Bring vinegar or a mix of vinegar and sour beer to the boil and let that get cold too. In the bottom of a glazed jar now sprinkle thyme, marjoram, crushed black pepper and mace, and place a layer of fish on top using a big spoon so you don't touch the fish with your hands. Repeat this until the jar is full, and pour over the cold vinegar. Thinly sliced onion should be placed on top to keep the fish down and covered with the vinegar.

FISH PATTIES

Boil a fresh firm fish in salted water, drain and let it cool before picking the meat off the bones. Chop the meat finely, and mix it with currants, ginger, pepper, salt and saffron plus grated fine bread or flour. Add eggs and a little cream until you have a firm paste. Shape to balls and fry in butter. Another way to prepare this paste is to make it thinner with more cream, and bake it like a pie. Cut this to pieces once baked and serve with a little sugar on. Comment: Dried or dried and salted cod was served in much the same way.

BERGENFISH IN POLIAN SAUCE

Soak the fish (salted and dried cod) in cold water, changing the water several times, until you can bend it, and then boil in water with some vinegar until tender. Make the yellow sauce as described below. Place the fish in a broad pan and pour over the sauce. Bring the dish to a boil, cover with a lid, and remove it from the fire. Let it rest for half an hour before serving to let the flavors mingle. Comment: Another source gives the following treatment: Bergenfish, the dried cod from Bergen in Norway must be beaten well to tenderise, cut to pieces, soaked 2-3 days in lightly salted water, soaked again in "lud" boiled from beech-ash for a day, soaked again in pure water for 2 days, and finally cooked in, for example, a pie.

* * *

As the use of the dinner plate replaced the medieval slice of coarse bread, it became increasingly popular to serve food in a sauce. The bread-thickened sauces, the black sauce and the yellow sauce, had been common since medieval times, and such sweet, dark spiciness was still popular, but the popularity of the first of the lighter and more modern flour-thickened sauces, the white béchamel sauce, had also spread to middle-class households.

BLACK SAUCE

Boil a hen or a carp in blood mixed with vinegar and water. Remove the meat from the liquid, thicken with grated gingerbread or rye bread, and season with chopped salted lemons, black pepper, cinnamon and saffron. Finally adjust the taste towards sweet or sour with sugar, honey or vinegar.

YELLOW SAUCE (also called Hungarian or Polian)

Boil chopped onion, apple, wheat bread and green parsley in a mix of water, white wine and vinegar. Use this soup for boiling your meat or fish unless it is already boiled. Season with pepper, saffron and sugar, and garnish with salted lemons.

WHITE SAUCE (in the new French style)

Boil a hen in beef stock with a chopped onion, vinegar and sliced fresh lemons. Remove the meat, thicken with fine flour, and season with mace, and ginger. Finally stir in some butter and garnish with chopped parsley. Comment: Beef stock was made like this: Beef stock is boiled on the bones and stringy meat with onions and roots until the meat may be easily pulled apart. Sieve, cool. Skim off fat, boil to concentrate

* * *

It was characteristic for the cooking of the time that the fish, poultry and meat in the dishes for the family would have been prepared not just in various ways, but in several ways. A piece of salted pork could thus be soaked, boiled briefly, and cut to cubes and fried, before being mixed with a sauce and baked into a pie, or it could be soaked, boiled until very tender, and pounded to a paste in a stone mortar, before being mixed with eggs and other ingredients, shaped to meatballs and fried or boiled again.

DUCK WITH TURNIPS

Place a cleaned duck in a lidded pot on a piece of fat pork rind, and add carrot, onion, cloves, salt, pepper, and chicken stock. Seal the lid with a flour paste and bake or simmer in a cauldron for an hour. Sieve the sauce and skim off the fat. Fry turnips in this fat, and serve them with the duck. Smoked duck and salted goose are also good this way, and so are squabs.

PORK ROLLS WITH CAPERS

Soak thin slices of salted, streaky pork in cold water. Chop capers, onion, and anchovies or red-spiced salted herrings, and fry this in butter along with grated bread and salted lemon. Stir in beaten egg until you have a paste. Spread the paste on the pork slices, roll, and place in a pie dish. Spread more grated bread on top and bake until golden. Serve with yellow sauce or mustard.

PORK IN YELLOW SAUCE

Boil a piece of ham or loin of pork. Grate wheat bread and peppercake into a pot and bring it to a boil in sweet wine. Add sugar or honey to taste, and also pepper, ginger, clove and saffron. Cut peeled apples into quarters, and braise them in a pot with yellow raisins, saffron, pork fat and a little wine. Serve the meat—whole or in pieces—garnished with the sauce and the apples.

RICE PUDDING

Wash rice and mix with finely chopped fat pork, whole pepper, cream, salt and marjoram. Fill into clean pig intestines or stomach, and boil well. Serve with apple sauce.

BEEF IN BLACK SAUCE

Soak a piece of salted beef and boil it until tender. Take chicken blood and beef stock, and boil it with

chopped apple and onion. Sieve and add fried onions, pepper, and cinnamon. Add the meat cut in pieces, and boil again. Season with vinegar, and serve garnished with apple or almond compote, and small black raisins.

The servants would most likely get anything left of the dishes above in addition to their gruel, but a simple meal of broth with bread and the boiled meat from the broth making was also possible. On days when the household had little time for cooking—such as washing, baking or slaughtering days—a cold meal of boiled eggs, or slices of cheese or sausage with bread and beer might be served to the servants as well as the family.

BOILED MUTTON

Soak a leg of mutton, and boil it until tender. Take some of the cooking liquid and boil it to a sauce with vinegar and sage leaves. Cut the meat from the bone, and cook the pieces again in the sauce before serving.

* * *

The most common preservation methods of drying and salting meant that long soaking and boiling were often necessary to make the food even marginally eatable again, but the long and complicated preparations were also a matter of preference. Not only was elaborately prepared food with minces and stuffing an indication of status, but food in its natural state was considered coarse and unhealthy, so even lettuce was usually cooked, and what was called a salad consisted of boiled vegetables in a marinade.

SPINACH THE HUNGARIAN WAY

Finely chop onion and mix with raisins in a pot. Add spinach and sour wine, and boil. Season with salt and sugar, and add some butter or olive oil. Good with fried salmon.

FRESH PEAS IN WHITE SAUCE

During the brief season for green peas this dish was as popular then as it is today.

Take fresh peas from their pods, and put them in a well tinned pot with good beef stock. Bring to a boil and add fine flour mixed with butter and finely chopped green herbs. Boil for a few minutes and serve warm. Smoked or salted pork may be cooked along with the peas or served beside them.

BEETROOT IN SOURCREAM

Take round beetroots of an even size and remove the leaves. Boil the roots until tender, let them cool, and remove the skin. Chop the leaves, and heat briefly in a pot. Add sour cream, but do not boil. Add mustard to the cream, and pour this over the roots.

* * *

Raw fruit was considered unhealthy, and—aside from a few berries and cherries—fruit was usually cooked before being eaten. During the summer season there would be the various berries both wild and from the gardens, and as few of these dried well for storage at least some of them would probably be served as a compote or in a jelly during their brief seasons. In the autumn grapes, wild damsons, plums and prunes would ripen, and most of this harvest would be dried and stored for treats during the winter. Just before the first freeze was expected, the storage apples and pears would be picked and either dried

or stored fresh on trays in a cool cellar to last as long as they could for the winter.

Of these fruits, apples were by far the most common, followed by grapes in central and southern Germany, and these two fruits were those most commonly preserved for storage. Preserving fruit mainly meant drying at the time, as sugar was so expensive that even a prosperous household would buy it only for special occasions. Preserving berries in a mix of honey and alcohol was also done, but such would be regarded more as a medicine than as a dessert.

STRAWBERRY COMPOTE

Press strawberries crushed with sweet wine through a sieve, and sweeten to taste with sugar or honey. If the dish is too runny, it may be made thicker with crushed wheat bread or peppercake.

RASPBERRY COMPOTE

Heat raspberries with grated wheat bread until the juice is released. Sieve and heat again. Serve with sugar on top or bake it into a pie. It is equally good cold or warm.

BERRY JELLY

If a stiff, clear compote is wanted for decoration, the berries must be boiled with quinces or green apples, and the juice allowed to drip through a fine cloth. Boil again until a drop remains hanging from your spoon, and let it set on a glazed platter or in a mold smeared with a few drops of almond oil.

DRIED CHERRIES

Place cherries on a grid, so that they do not touch, and place in a warm oven. When dried they keep well. When wanting to serve the cherries, this is a good way: take equal parts water and wine, and heat the cherries in this. Sweeten with sugar. Fry bread in butter, and serve the cherries on top of the bread.

APPLE PANCAKES

Mix flour to a batter with milk or wine, and add thinly sliced apples, currants, and sugar or honey. Bake in butter in a frying pan, and serve with more sugar or honey.

BAKED APPLES

De-core apples and fill the hole with butter, cinnamon, and sugar or honey. Bake in a lidded pan heaped with coal. If bread is being baked in the house, the apples may also be wrapped in fine dough, and baked in the oven once the bread has been removed. This is also a good way of cooking quinces.

APPLE FRITTERS

Make a thick batter of fine wheat flour, beer and eggs, dip rings of fresh or dried apples in the batter, and fry in ox or pork fat. The batter may also be made thicker, and fried as balls, before being eaten with a sweet applesauce.

PEAR FRITTERS

Peel firm pears, dip them in a thin batter of flour and egg, and fry in butter until fine and brown. Grate peppercake and bring to a boil in sweet wine. Season with cardamom and serve with the pears.



CHEESE FRITTERS

Grate fresh, fat cheese, and mix with egg, ginger, mace, saffron, currants, crushed almonds, and wheat flour or grated wheat bread. Fry in fat and serve quickly.

BLACK CURRANT REMEDY

Mix black currants with honey and cover with brandy or aqua vitae. A spoonful of this mixed into a mug of hot wine is good against a cold in the body or head.

* * *

The same dishes that were served to the family at the mid-day meal could also be served in the evening either as cold leftovers or freshly prepared, but the most usual combination would be to serve any leftover meat or fish combined with a fresh pie or another delicate meat dish. Some families also had soup for their evening meal.

BEEF WITH GARLIC

Boil beef in good beef stock with peeled garlic, grapes and parsley. Season with salt. Serve the meat in slices on a platter with the sauce poured over.

MEAT PIE

Soak salted meat for at least a day. Cut the meat to pieces, and place it in boiled and cooled sour wine for several hours. Chop the meat finely and mix with the marinade, saffron, cloves, cinnamon, grapes, raisins and chopped ox marrow or pork fat. Place it in a pie dish and cover with more spices, raisins and

grapes. Press a lid of fine dough on top, brush with egg white, and make a hole in the middle of the dough. Bake and when half baked pour in stock spiced with saffron. It is well to place a layer of boiled, peeled eggs or chicken meat in the middle of the minced meat.

CHICKEN PIE WITH QUINCES

Remove the cores from the quinces, and chop one finely. Mix the chopped quince with salt, ginger, cloves and pepper, and place it inside a big chicken. Place the chicken on a layer of bread-crumbs in a big pie dish surrounded by the rest of the quinces and a little white wine. Sprinkle more of the spice-mix on top as well as many small cubes of butter. Cover with a lid of fine dough, brush with beaten egg, and bake for at least two hours. The baking time becomes shorter if the chicken is half-cooked and the quinces softened in butter before being baked in the pie.

The dish below is in the new French style; notice that this is not a sweet dish.

EGG PIE WITH APPLES

Fry peeled apple boats in butter, remove from the heat, and add fresh raw eggs—beaten or unbeaten—to the pan. Cover with a lid and surround the pan with coal. Bake, but not too hard, pour off any liquid, and sprinkle with salt and ginger.

TENDERLOIN SAUSAGE

Finely chop a fresh tenderloin, and mix carefully with egg, salt, pepper, ginger and saffron. Shape to elongated balls, and let them simmer in an inch of water until firm. Remove them and serve with the cooking liquid either as it is or used as a base for one of the sauces above. The spiced meat paste may also be stuffed into clean intestines before being boiled. Such a sausage may then be cured in a strong brine, and hung to be smoked in the chimney. Instead of being served in a sauce such a sausage is very good with soup or a dish of cabbage.

HEN IN HORSERADISH

Peel and crush almond, and mix it with peeled and grated horseradish. Place the meat from a boiled hen on toasted wheat bread, and spread the horseradish paste on top. If the paste seems too dry, a bit of the cooking liquid from the hen might be added.

* * *

For the servants, the evening meal would most likely be the leftover boiled meat from the mid-day meal turned into a stew with lots of coarse vegetables, such as cabbage, kale, roots and onion, and with plenty of barley or oat to make it filling. If such a stew had been their main fare for the mid-day meal, it would also be quite normal to dilute any leftover stew into a soup for the evening meal, along with the usual bread and beer

CABBAGE STEW OR SOUP

Boil bones from a pig in water for several hours along with the coarse green leaves of leeks, the stalks from parsley, the top of parsnips, and any other greens you might have. The bones may be from a freshly slaughtered pig, or from salted or smoked pork. Sieve the soup, and scrape any bits of meat from the

bones. Return the soup to the fire and add the meat, along with chopped head cabbage, leeks, thyme and carrots. The dish may be made thicker with oat meal or cracked barley, and it is equally good as a soup or a stew. Serve with rye bread and mustard.

* * *

Nearly all modern European dishes could be made the kitchens of 1632 if the household had access to the ingredients—from pancakes and pot roasts to the Yorkshire Puddings made by pouring batter into the tray with hot drippings beneath the roast. But the traditions for how the food was acquired, cleaned, preserved, cooked, spiced, etc. had their basis in the medieval traditions, and would seem quite strange to a modern American.



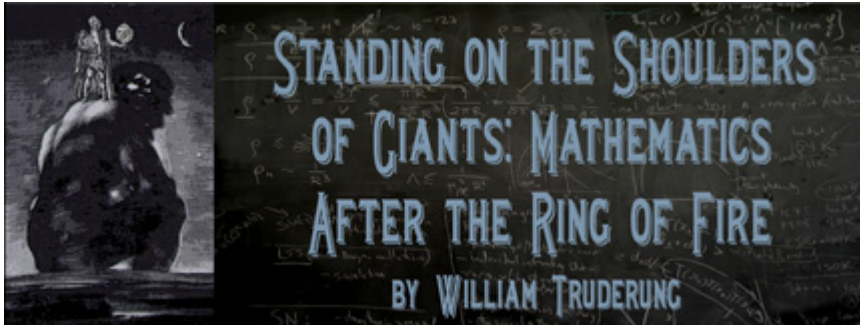
Take a thing like cleaning. A 1632 kitchen would probably seem dirty to a visiting American, what with its open fire, sooty walls, and dirty floor and tables. But what has to be remembered is that one of the processes that differed the most between then and now is how water was acquired. Water in 1632 might not be good to drink unless boiled, but it was still needed for all the usual tasks of cooking, cleaning, and washing. And every drop had to be winched up from a well and poured into buckets for carrying or barrels on a cart before being carried, pulled or driven to the house and poured into the big water barrels inside or outside the kitchen. It would then be ladled into smaller containers when needed. After use, the dirty water would be carried out of the house and thrown on the ground or in the open gutter. It was not that the technology wasn't able to make water-pipes and various pumping systems, and in several places in Europe experiments with indoor water was taking place, but this was not something people in general had either heard of or would consider a possibility for them.

Standards of cleanliness and sanitation are sure to increase with the spread of new technology and knowledge about how important hygiene is in keeping people healthy. Freezers and refrigerators, along with knowledge about nutrition, are also sure to replace much of the salted meat with fresh and add more fresh vegetables to everybody's diet. However, a lot of people are also going to want the food they are used to, and an American staying with a local family—or in an inn—should definitely expect pea mush and black pudding rather than meat loaf with potatoes.

Standing on the Shoulders of

Giants: Mathematics After the Ring of Fire

Written by William Trudering



The Ring of Fire was an event that shook the world of 1631 to its foundations. One of the disciplines destined to be revolutionized is mathematics, which was still in its infancy at the time. This article looks at what changes the coming of Grantville would be likely to make to the mathematics of the day.

European Mathematics Before the Ring of Fire

In many ways, the mathematics of the early to mid seventeenth century resembled our own. The modern Hindu-Arabic number system was in regular use, almost completely replacing the old Roman system that used "I V X L C D M." Decimal fractions were also coming into use, and most of the common symbols for arithmetic operations were at least known, if not yet common. Algebra texts used letters to represent constants and variables (although the use of "x y z" to represent unknowns would not reach print until 1637) and many basic functions, such as the trigonometric functions and the logarithmic function (to base 10 as well as base e), were known. Many of today's techniques were already in use, such as proof by induction, and the method of exhaustion. Infinite series and continued fractions were being used, and imaginary and complex numbers were understood, if not yet fully accepted (even negative numbers were regarded with considerable suspicion at this time). The slide rule, both circular and straight, had already been invented, although this invention was not described in a book until 1632, and the first logarithmic tables had been published in 1617. Early steps toward generalization and abstraction were being taken, such as the efforts by Desargues to generalize geometry beyond what the ancient Greeks did. A number of foundational ideas were "in the air"—the first book on coordinate geometry was within a few years of being published (although a number of mathematicians had independently discovered the basics by this time), and the problem of infinitesimals, limits, and the calculus was an active area of study. Even the first book of mathematical puzzles and recreations for a popular audience had been published, in 1612. Of course, the mathematics of the age was rudimentary compared to that of today, but it had already assumed modern form.



Without a doubt, the greatest living mathematician of the age was Pierre de Fermat (French, 1601-1665). He was a lawyer by vocation, and thus is often considered the greatest amateur mathematician in history, although the line between professional and amateur mathematician was not yet clearly defined. Among his numerous accomplishments, the most well-known must be his creation of the modern theory of numbers. A literal side-note of this was his famous "Last Theorem," that if an integer n is greater than two, the equation $a^n + b^n = c^n$ has no solution for any positive integers a, b, c .

The nature of Fermat's putative proof of this theorem has been a mystery to this day—and will almost certainly remain a mystery in the new timeline, as the marginal note concerning it was not written by Fermat until 1637 in our timeline, and is very unlikely to ever exist in this one. Fermat will be as puzzled as everybody else about his most famous theorem. Perhaps greater than his work on number theory was his discovery of methods of finding the greatest and smallest ordinates of curved lines, which prefigured much that became differential calculus, and his discovery of methods to evaluate the integral of general power functions. Given the context of the limited mathematical development of that time, this was just as impressive as Leibniz's and Newton's inventions of the full (integral and differential) calculus. By the time that Newton and Leibniz did their work, most of the foundations of the calculus had already been laid by others, but Fermat worked in an era when those foundations were much less developed. Fermat was among the most wide-ranging of mathematicians. His other work included inventing analytic geometry independently of the more well-known results by René Descartes, co-founding probability theory with Blaise Pascal, and inventing the proof technique of infinite descent. To this day, he is in the running for the title of "greatest mathematician in history."

Fermat was one of a dozen mathematicians of considerable talent who were alive when the Ring of Fire occurred. The oldest of this group was Grégoire de Saint-Vincent (Belgian, 1584-1667), who introduced the method of exhaustions to proofs, produced results leading to the theory of logarithms, and described the Mercator series. Not as well-known as Fermat but just as original was Gérard Desargues (French, 1591-1661), who invented projective geometry, the first extension of geometry beyond the limits known to the ancient Greeks. His work was eventually virtually forgotten, only to be redeveloped by others over a century later. He is mentioned in several places in the 1911 Encyclopaedia Britannica, but the references to him are short—as was to be expected, since the only known copy of his book on projective geometry was not rediscovered until 1951. René Descartes (French, 1596-1650) was most famous for his invention of analytic geometry, but did other significant work, such as discovering the "rule

of signs" for determining the zeros of a function, and creating modern exponential notation (as well as introducing x , y , z to represent unknowns in an equation). Bonaventura Cavalieri (Italian, 1598-1647) developed a method of indivisibles, which are a significant step on the way to modern infinitesimal calculus. He was four years older than Gilles Personne de Roberval (French, 1602-1675), who also invented the method of indivisibles (which he unfortunately did not publish, therefore losing credit), and developed a very general method of drawing tangents, thus contributing greatly to the foundations of the calculus. He and Descartes did not get along, since Descartes had criticized some of Roberval's mathematical methods, and Roberval returned the favor. Bernard Frénicle de Bessy (French, 1605-1675) produced many results in number theory and in combinatorics. He described all 880 essentially different magic squares of order 4.

The final five people in this group were still under the age of fifteen on the day of the Ring of Fire. John Wallis (English, 1616-1703) in our world extended the methods of analysis of Descartes and Cavalieri. His 1655 book on conic sections was the first book to study them analytically, and his 1693 book on algebra contained the first systematic use of formulae. Blaise Pascal (French, 1623-1662) would discover Pascal's theorem and the "mystic hexagram" at the age of sixteen, and go on to co-found probability theory with Fermat, discover "Pascal's triangle" for binomial coefficients, and invent an early calculating machine. He is probably best known for his writings as a philosopher. Born three months later, Stefano Degli Angeli (Italian, 1623-1697) in our timeline used infinitesimals to study spirals, parabolas and hyperbolas. Johannes Hudde (Dutch, 1628-1704) worked on maxima and minima, and on the theory of equations. He was known for finding an ingenious method to find multiple roots of an equation. Finally, the infant Isaac Barrow (English, 1630-1677) would develop a method of determining tangents that closely approached the methods of calculus, and was the first to recognize that integration and differentiation are inverse operations.

Another dozen mathematicians of some significance were also alive on the day of the Ring of Fire. Joost Burgi (Swiss, 1552-1632) invented logarithms independently of Napier, but by delaying publication, lost priority. He was a major contributor to prosthaphaeresis, a technique for computing products quickly using trigonometric identities, which predated logarithms. Thomas Fincke (Danish, 1561-1656) is also still alive, and remained so in our timeline for many more years. His 1583 book "Geometria rotundi" introduced the trigonometric functions tangent and secant. William Oughtred (English, 1574-1660) published his most important book in 1632. *Circles of Proportion and the Horizontal Instrument* described his invention of the circular and straight slide rules. Two years younger was Paul Guldin (Swiss, 1577-1643), who discovered the Guldinus theorem to determine the surface area and volume of a solid of revolution. Claude de Méziriac (French, 1581-1638) worked on the solution of indeterminate equations by means of continued fractions. He also did work on number theory, and was possibly the discoverer of Bézout's identity. His 1612 book, *Problèmes plaisants*, was the first book of mathematical puzzles and recreations.

Among the younger men was Albert Girard (French, 1595-1632), who died very young. Perhaps he will live longer in the new timeline. He contributed to the early development of the fundamental theorem of algebra, and introduced the abbreviations sin, cos and tan (without a period) in a 1626 treatise. He spent his adult life in the United Provinces, and spent his last years as an engineer in the Dutch army. Jacques de Billy (French, 1602-1679) corresponded with Fermat and produced a number of results in number theory which are named after him. He was one of the first to decisively reject the role of astrology in science. Juan Caramuel y Lobkowitz (Spanish, 1606-1682) expounded the general principle of numbers to base n , pointing out the benefits of some other bases than ten. André Tacquet (Belgian, 1612-1660) published his most important work, *Cylindricorum et Annularium* (Cylinders and Rings) in 1651, introducing the idea, later elaborated by Barrow, that the tangent of a curve and the area under a curve were inverse to each other.

Still children are William Brouncker (Irish, 1620-1684), who worked on continued fractions and calculated logarithms by means of infinite series; René François Walther de Sluze (French, 1622-1685), who discovered the curves called "the pearls of Sluze." Christiaan Huygens (Dutch, 1629-1695) is more famous as a physicist and astronomer but he discovered that the cycloid (the curve traced by a point on the edge of a circular wheel rolling along a straight line), when inverted, was a tautochrone curve (a curve for which the time taken by a frictionless particle sliding down it under uniform gravity to its lowest point is the same, regardless of its starting point on the curve). Huygens wrote the first book on probability theory, in 1657.



A special mention must be made of Marin Mersenne (French, 1588-1648), a priest of the Order of the Minims, who while not particularly noted for his own discoveries (although he did work on the cycloid, among other topics including number theory), was important for acting as a central clearinghouse for mathematical discoveries, corresponding with most of the mathematicians active at the time. In the time before mathematics journals existed, he played much the same role. In Kim Mackey's story "Essen Steel: Crucibellus" (*Grantville Gazette*, Volume 7), he was one of the three people to whom Colette Modi started to send her trimonthly summaries of up-timer mathematics. Colette knew that he would spread the contents by writing to virtually every down-time mathematician of significance.

What Came Through the Ring of Fire

The mathematics texts that went through the Ring of Fire almost certainly formed a pyramid, with many basic and high school level books, fewer undergraduate texts, still fewer graduate texts, and possibly a very few advanced monographs.

The number of advanced texts on mathematics that came through the Ring of Fire depends on how many up-timers had a reason to have them in their personal or professional libraries. Thirteen up-timers are known to have degrees in mathematics, three of them with master's degrees. The bachelor's degree in secondary mathematics education includes the same required mathematics courses as the bachelor's degree in mathematics, so I am including it as a degree in mathematics.

There are at least 48 additional up-timers who have degrees involving significant amounts of mathematics. Many of these people would have attended West Virginia University. The current required

courses for a bachelor's degree in physics, or in aeronautical, civil, chemical, electrical or mechanical engineering, from that institution include Calculus I and II, Multivariable Calculus, and Elementary Differential Equations. In addition, a bachelor's degree in civil or electrical engineering requires Probability and Statistics. The required courses for a bachelor's degree in computer science include Calculus I and II plus Discrete Mathematics, as well as Probability and Statistics. All of these courses would have been taken in the first three years of study. Two additional people are known to have taken the first three years of a degree in engineering, and another person has the first two years of an engineering degree. Fourteen additional up-timers are known to have taken the first two or three years of an unspecified bachelor's degree, and a few of those degrees are also likely to have been math-intensive. A list of up-timers known to have degrees (or the first two or three years toward a degree) in mathematics or mathematics-intensive subjects is included as Appendix One.

Many of these people are likely to have kept all of their college textbooks. In addition, some of them probably had a great many additional books that they obtained beyond those necessary to get their degrees, either from a personal interest in the subject or from a desire to expand their knowledge for work-related reasons. Between them, these people are likely to have brought with them a good selection of undergraduate texts in all fields of mathematics, as well as a smaller but still significant number of graduate texts and monographs, and probably a few advanced research monographs on topics that had gained somebody's interest.

Many of these people are also likely to have collected a number of popular books on such subjects as recreational mathematics or mathematical history and biography. This would be especially true of those people with degrees in mathematics education, who may have hopes of generating interest in mathematics among their students. Beyond this core group are people with no mathematics-related degree but who simply like mathematics, most of whom are also likely to have personal collections of mathematics-related books.

The best library collection of mathematics books in Mannington (the model for Grantville) is the one at North Marion High School. These books are written at a more basic level than the ones discussed above, but books at this level are essential to help bridge the gap between down-time mathematics and the more advanced up-time texts. In addition, there are the high school textbooks. Books of particular interest known to be at the high school library include the following:

A four-volume set entitled *World of Mathematics: A Small Library of the Literature of Mathematics from Ahmose the Scribe to Albert Einstein* (1956, 2535 pages) is a collection of the writings of historical mathematicians. Books that describe the history of mathematics include *Mathematics and the Physical World* (1959, 482 pages) and *Mathematics for the Million* (1965, 697 pages), among others. *Men of Mathematics* (1965, 590 pages) by E. T. Bell is entertaining, if unreliable. The library has five different dictionaries of mathematics, ranging from 223 to 509 pages. One of these dictionaries is indexed in French, German, Russian and Spanish. One of many copies of *CRC Standard Mathematic Tables* is in the library. It may well end up being sold to a university for their own collection, where it would no doubt be heavily used.

What is Mathematics? An Elementary Approach to Ideas and Symbols (1996, 556 pages) has the following catalog description: "discusses the history and philosophy of mathematics and presents its principles, covering the number system, geometry, algebra, topology, functions and limits, calculus, and other related topics such as the Four-Color Theorem and Fermat's Last Theorem." This sounds like a good general introduction to up-timer mathematics. More basic texts include *Realm of Numbers* (1959, 200 pages) by Isaac Asimov, aimed at younger readers. The catalog description of this book says: "Explanations of mathematical techniques and principles are combined with the history of mathematics. Includes simple arithmetic, square root, logarithms, and even imaginary numbers."

The Mannington Public Library mathematics collection is much smaller, and appears to include little of interest, although it is known that some of its overall holdings are not listed in the online catalog.

Other sources of information on mathematics will be found in such places as encyclopedias and some books on science, especially physics and astronomy. For example, the 1911 Encyclopaedia Britannica, which is known to exist in Grantville, has the following major mathematics-related articles, each containing more than ten thousand words:

Algebra (30K words)
Algebraic Forms (32K words)
Arithmetic (29K words)
Curve (18K words)
René Descartes (16K words)
Differential Equation (24K words)
Dynamics (11K words)
Energetics (12K words)
Equation (20K words)
Function (51K words)
Geometry (81K words)
Hydromechanics (29K words)
Infinitesimal Calculus (26K words)
Logarithm (15K words)
Mensuration (20K words)
Isaac Newton (15K words)
Probability (48K words)
Projection (12K words)
Spherical Harmonics (16K words)
Surface (13K words)
Theory of Groups (19K words)
Thermodynamics (11K words)
Trigonometry (19K words)

These articles are admittedly almost a century old, but the information contained in them would still be accurate.

Difficulties Faced by Down-time Mathematicians

A down-timer reading an up-time mathematics text would be faced by several difficulties. First of all, the book would be written in English, not Latin. Latin was the language of down-time scholars for a very practical reason. Scholars could write to each other, in letters or via books, and be understood all across Europe. In addition, a single printing of a book written in Latin would be sufficient to reach all of its intended audience, instead of needing to be translated into a multitude of languages. This problem can be remedied, but it will take some time for the scholars wishing to study the up-time mathematics to learn to read English, and an even longer time for the texts to be translated into Latin.

We see this process under way in Jack Carroll's story "Stepping Up" (*Grantville Gazette*, Volume 14), where a group of down-timers, who know Latin, are told that once they have learned electrodynamics, they will be the first scholars in Europe to be able to write electrodynamics texts in

Latin. Whether this is actually true is debatable, since many people across Europe are no doubt also studying electrodynamics, because of the obvious benefits that radio would provide. A number of these people are likely to also be literate in Latin.

Another obvious difference from the down-time texts is the greater use of symbols instead of verbal argumentation, some of which would be completely unfamiliar. Among the symbols which a down-timer would know are the symbols for addition "+" and subtraction "-". Originating as marks to indicate full and underweight barrels, they first appeared in print in Johann Widman's 1489 book *Und hüpsche Rechenung auff allen Kauffmanschafft*, but did not go into common use until the second half of the sixteenth century. The use of "x" for multiplication had just been introduced in William Oughtred's 1631 book *Clavis Mathematica* (which also saw the first use of plus-or-minus "±") but was otherwise unknown. However, the common symbol for division "÷" would not be invented until 1659 (Johann Rahn's book *Teuche Algebra*), and the use of "/" to indicate fractions is first attested in 1718.

The symbol for equality "=" was known but rare. It was first used in Robert Recorde's 1557 book *Whetstone of Witte* (which also popularized the "+" and "-" symbols) but not used again until 1616 in an anonymous appendix—probably written by William Oughtred—to Edward White's translation into English of John Napier's 1614 book *Mirifici logarithmorum canonis descriptio*.

Decimal fractions were slowly gaining in popularity. They had been used by Arab mathematicians for centuries, but were not used by Europeans until 1530, when Christoff Rudolff in his *Exempel Büchlin* used a vertical bar "|" as a decimal separator. These fractions were popularized by Simon Stevin in his 1585 book *La Thiende* (The Tenth) and *La Disme* (The Decimal), using his own notation. The modern notation, using a period or comma for the separator, was first used in G. A. Magini's 1592 text *De planis triangulus*, and popularized by Napier in his 1614 book.

The square root radical "√" was used surprisingly early, in Christoff Rudolff's 1525 book *Die Coss*, although the use of index numbers within the radical to indicate cube roots, etc., had to wait until Albert Girard's 1629 book *Invention nouvelle*.

Square brackets "[]" had been introduced in Raphael Bombelli's 1550 book *Algebra*, while parentheses "(")" appeared soon after, in Nicolo Tartaglia's 1556 book *General trattato di numeri e misure*, and braces "{"}" were used in François Vieta's groundbreaking 1591 book *In artem analyticem isogoge*.

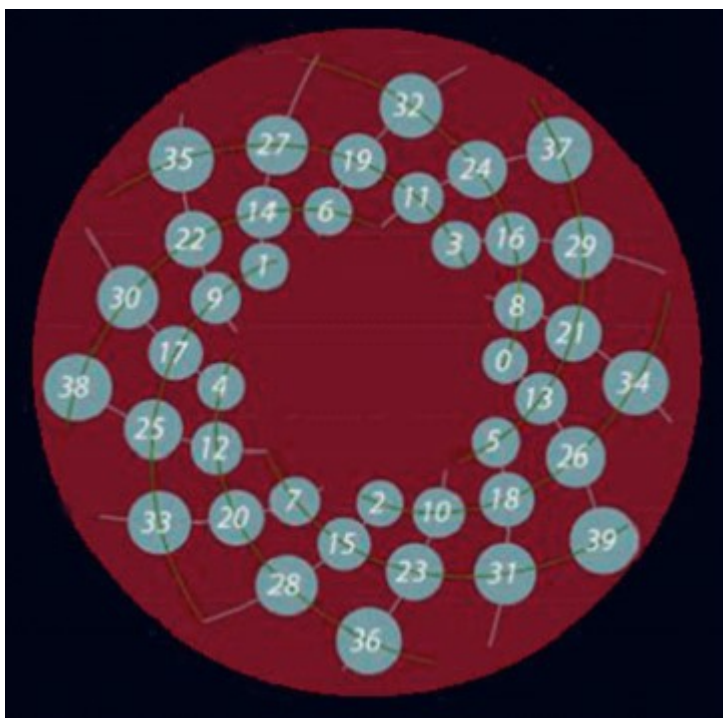
A few functions had nearly modern abbreviations by the time of the Ring of Fire. The trigonometric functions sine, cosine and tangent had been abbreviated as "sin.", "cos." and "tan." in Thomas Fincke's 1583 book *Geometria rotundi*, although the period was not dropped until almost half a century later, and the newly introduced logarithm was abbreviated to "log." in Edward White's 1616 translation of Napier.

Once the up-time mathematical symbolism was learned, a further problem would be faced. Modern mathematics is far more abstract and generalized than anything a down-time mathematician would have known. In fact, a major branch of modern mathematics called category theory is jokingly called "general abstract nonsense". Modern mathematics is also far more rigorous in its proofs than is commonly practiced down-time, and indeed proof theory is studied as a separate branch of mathematics. This is related to the fact that modern mathematics is heavily axiomized, meaning that in each formal system of study, the most basic concepts are explicitly stated as axioms, and the rest are logically derived from the set of axioms. This concept had been used by the ancient Greeks with Euclidean geometry, but had only been extended to up-time mathematics as a whole since the nineteenth century.

The Growth of Mathematical Activity

One of the biggest long-term effects of the Ring of Fire will be on the number of qualified mathematicians in Europe. The list of down-time mathematicians given earlier contains 24 of the most significant names in the mathematics of the time, but eight of those people are still children, and another would presumably have still been an undergraduate in today's world. Another person was very elderly, due to expire of old age in 1632. This leaves 14 people, all men, who would be talented enough to have been employed in a modern university's department of mathematics once they had studied the up-time mathematics. These are the cream of down-time mathematicians, but there were certainly many more people who contributed in a lesser way, some of whom were also members of Marin Mersenne's circle of correspondents. Mersenne does not know that the author of the "Crucibellus Manuscripts" is a woman, but Colette Modi will be only the first of a great many female mathematicians to appear. In our timeline, the first modern woman to lecture in mathematics at a great university was Elena Lucrezia Cornaro Piscopia (1646-1684), who was also the first woman in Europe to receive a Ph.D., from the University of Padua. In this timeline, we may expect that roughly half of the bachelor's degrees in mathematics will eventually be awarded to women, as is the case today.

How many people in Europe could potentially become top-ranked mathematicians? One way to answer this question would be to look at how many PhDs (as an indicator of people with outstanding mathematical talent) are awarded today. In the USA from 1990 to 1996, about eight thousand PhDs were produced by US mathematics departments, or about 1,140 per year. The percentage of those PhDs who were born in the USA has remained steady at 43 to 44 percent in that time span, so the USA, with about 3.7 million live births (that survived infancy) per year when those people were born, can produce about 135 PhD recipients per million surviving children. This rate should be regarded as a minimum, since many people who have the ability to earn a PhD in mathematics do not do so, for one reason or another.



According to Roger Mols, "Population in Europe 1500-1700" (*Economic History of Europe*, ed. Carlo Cipola) the total population of Europe (including the Balkans) grew from about 100-110 million in 1600 to about 110-120 million in 1700. The number of live births per year would have been about 3.5

percent of that number per year, or about 3.5 to 4 million babies per year. At the time of the Ring of Fire, at least half of these infants would die before their tenth birthday, but given reasonable assumptions about the expected decline in infant mortality over the following several decades, it seems likely that by 1660, about 3 million Europeans will see their tenth birthdays that year (provided that the birth rate remains where it is). This suggests that by then, there would be at least 400 people having outstanding mathematical ability who turn ten each year. This number may be in excess of the capacity of the European educational system to provide with a high-level education in mathematics. Before students embark on a post-secondary education, they must first pass through primary and secondary school, so a system of universal education through high school must be set up across Europe.

At the start, it is likely that only a few major institutes capable of conducting significant new mathematical research will exist. Mathematicians need daily feedback to produce their best work, both as a source of new ideas and as an incentive to keep improving on their own past work. The existing body of up-time and down-time mathematicians is probably sufficient to populate two or maybe three such institutions.

Almost certainly, the list of locations for such an organization will include Essen, where Colette Modi of Crucibellus fame now lives. Her patron and uncle Louis de Geer is interested in modernizing the new Republic of Essen, and is likely to encourage the development of a "technology research and development center" built around such an institute. Given that Colette Modi is in Essen, this site may become a magnet for women seeking to do mathematics, once Colette's identity is revealed. It is quite possible that the institute in Essen will be the first (but not the last) such institution in modern Europe to have a female chief researcher, and might be named for an historical (Hypatia) or "would-have-been" (Sophie Germain, Emma Noether, Ada Lovelace) woman in mathematics.

Magdeburg, or possibly Grantville, would be another obvious location. Grantville would have the advantage of being the source of the up-time texts (although the more important books are likely to all have been reprinted in Latin within a few decades at most), while Magdeburg has the new Imperial College of Science, Engineering and Technology. Jena is another possibility. By 1633 it already had a professor of statistics in Carol Koch, who came through the Ring of Fire with a bachelor's degree in mathematics and statistics. The center of the mathematical universe before the Ring of Fire was Paris, as can be seen by the fact that 10 of the 24 top down-time mathematicians were born in France. Cardinal Richelieu is more than intelligent enough to see that creating such an institute is an economical method of attracting the people he needs to ensure the economic and technological future of France. Any government interested in keeping up with the USE will want to establish at least one department of advanced mathematics within their universities. A start on such a department already exists in the circle of Mersenne's correspondents. Fermat and Descartes may not be as familiar with up-time mathematics as those up-timers with degrees in mathematics (at least not until they have had a chance to catch up), but they are still almost certainly the greatest mathematical minds in Europe. It is probable that if they do decide to stay with Mersenne, many others will also wish to study with them.

Progress in mathematics is helped by frequent, rapid communication of new results. To accomplish this on a continent-wide basis, mathematical journals are needed. As noted concerning Marin Mersenne, none of these existed at the time of the Ring of Fire. This is likely to change very quickly. A start on this was already being made in 1632, with Colette Modi's "Crucibellus Manuscripts." To quote from Kim Mackey's story "Essen Steel: Crucibellus" (*Grantville Gazette*, Volume 7):

To say that the Crucibellus Manuscripts took the European mathematical community by storm would be a vast understatement. In early 1632 many Europeans were still unaware that something unusual had happened to their universe. Even those who had heard the tales of a community of Englishmen in Thuringia tended to discredit the idea unless they had actually traveled to Grantville themselves. But when the Crucibellus Manuscripts began circulating in

1632, people's minds began to change. It was not that all of the concepts were totally new and different. But it was the style and the breadth and the mystery which set intellectual circles abuzz. For Crucibellus had outlined the topics of future manuscripts and promised that each would appear at approximately three month intervals. Mathematical Symbology of the Future. Analytical Geometry. Differential Calculus. Integral Calculus. Differential Equations. Matrix Algebra. Probability. Statistics. Fractals. Special and General Relativity. Quantum Mechanics.

These trimonthly manuscripts could be considered the first mathematical journal. Others will surely follow.

Once the available texts have been studied and digested, the mathematicians of the post Ring of Fire world will be faced with the enormous task of reconstructing all the mathematics that did not make it down-time. Many areas of higher mathematics will have most or all of their major results known, but without proofs, since the up-time texts will have skipped most of the proofs to save page space. Given what tools are available, it should be time-consuming but feasible to eventually redo the missing proofs. This will be a lengthy process, as some proofs are very long. For example, the classification of the finite simple groups took almost 15,000 pages in around 500 journal articles. Other areas will be known of in passing, but with only a few scattered references to results, they will have to be essentially redone from scratch. In any case, the mathematicians of the day will be aware that generations or even centuries are likely to pass before they reach the boundaries of what had been reached up-time.

Another area of great activity will be using the up-time mathematics to advance science and technology. The available up-time texts in engineering will be useful, but are unlikely to include the full mathematical development of the theories behind the described technologies, which will need to be redeveloped. More pressingly, for some considerable time the number of people able to understand mathematics well enough to efficiently design electronic or other advanced technology will be very low. Most mathematicians will be likely to spend most of their working time either teaching, or helping with various technology development projects as time allows, instead of working on mathematical research.

Appendix One: Known Up-timers with degrees in Mathematics of Math-intensive subjects

PEOPLE WITH DEGREES IN MATHEMATICS

Emmanuel Onofrio (1930) M.A. in mathematics
Viola (Petrini) Saluzzo (1942) B.A. in secondary mathematics education
Allan Sebastian (1954) A.B. in secondary mathematics education
Jennie Lee (Song) Cheng (1958) B.A. in mathematics
Carol Elizabeth (Unruh) Koch (1959) A.B. in mathematics and statistics plus a couple of graduate courses in sampling
Horace Bolender (1961) B.A. in statistics
John Lobkowitz (1961) B.A. in mathematics, M.Ed. in mathematics education
Kimberly Jane (Collins) Glazer (1963) M.A. in applied mathematics
Lennon "Lenny" Washaw (1966) B.A. in mathematics; A.B. in mathematics education; most course work for an M.Ed. completed
Anselm Gerard (1967) B.A. in mathematics, .Ed. in mathematics education
Johnny Lee Horton (1967-1633) A.B. in mathematics; M.Ed. in mathematics education
Kelley Josefina Bonnarro (1972) A.B. in mathematics
Jerome Vincent "Jerry" Calafano (1972) M.A. in mathematics, M.Ed. in mathematics education

PEOPLE WITH OTHER MATH-INTENSIVE DEGREES

Alvin Pierce (1927-1638) A.B. in mathematics education
Asa McDonald, (1930) B.A. in mechanical engineering
Charnock David "Chuck" Fielder (1931-November 1634) M.A. in physics
Henry "Hal" Smith, Sr. (1932) M.E. in aeronautical engineering
Marshall Ambler (1944) B.S. in engineering
Garland Franklin (1944) B.S. in civil engineering
John Chandler Simpson, (1945/1950) B.S. in engineering
Otto Kubala, (1946) B.S. in mechanical engineering
Kyle Fleming (1947) A.B. in mathematics education
James D. "Darry" Kip (1947) A.B. in mathematics education, with coursework towards M.A.
Joseph Jesse Wood, "der Adler" (1950) B.S. in engineering
Claude Yardley (1950) A.S. in electrical engineering
Elaine (Mockbee) Pierce (1951) B.S. in mechanical engineering
James Alvin Pierce (1951) B.S. in mechanical engineering
Norris Patton (1953) B.S. in electrical engineering
Bill Porter (1953) B.S. in electrical engineering
Peter Rush (1954) M.S. in computer science
Bob Kelly (1955/1960) M.S. in civil engineering
Marshall Kitt (1956) B.S. in mechanical engineering
Sara Lynn (Larson) Shaver (1956) B.S. in engineering
Natalie (Fritz) Bellamy (1957) A.B. in mathematics education
Jason Cheng (1957) B.S. in mechanical engineering
Matthew Difabri (1957) A.A. plus course work toward B.A. in engineering
Ronaldus "Ron" Koch (1957) B.S. in civil engineering; M.E. in mining engineering
Simon Koudsi (1957) B.S. in mechanical engineering
Peter Barclay (1958) B.S. in mechanical engineering
Vanessa (Holcomb) Kitt (1958) B.S. in computer science
Matthew Shaver (1958) M.S. in engineering
Kay (Doxtader) Kelly (1959) B.S. in mechanical engineering
Jacob Bruner, (1961) BS in civil engineering
Farris Clinter (1961) B.S. in civil engineering
Jere Haygood (1963) B.S. in civil engineering
James Michael "Jim" McNally (1964) B.S. in physics
Ripley Cunningham (1965) B.S. in computer science
Joseph Hayes Daniels (1965) B.S. in computer science
Lewis Hunsaker (1965) A.A. in chemical engineering
Mason Chaffin (1966) B.S. in civil engineering
Allen Lydick (1971) B.S. in civil engineering
Derek Modi (1971) M.A. in civil engineering
Laban Trumble (1971-1633) B.S. in engineering
John McDougal "Mac" Clements (1972) M.S. in physics
Jerry Trainer (1973) B.S. in chemical engineering; graduate student in chemical engineering
Thomas Holcomb (1976) B.S. in computer science
Landon Reardon, (1977) B.A. in physics
Eve Zibarth (1977) enough courses to make a B.S. major in physics
Jason Gotkin (1978) A.B.-6 in computer science
James Victor Saluzzo (1978) A.B.-6 in physics

Danny Song (1978) B.S. in computer science

PEOPLE WITH THREE OR TWO YEARS OF MATH-RELATED UNDERGRADUATE SCHOOLING

Mark Johnson Ellis (1979) three years of college in civil engineering

Dane Marshall Kitt (1979) three years of college in mechanical engineering

Matt Carson (1963) two years of college, engineering major

Safety First: Industrial Safety in 1632, Part Two, Technical Aspects

Written by Iver P. Cooper



Ambrose Bierce, in *The Devil's Dictionary*, defined an "accident" as "an inevitable occurrence due to the action of immutable natural laws." But some industrial accidents are avoidable, and the secret to minimizing them is to know what the hazards of the job are, and to reduce those hazards by a combination of engineering controls (e.g., safer machinery), administrative controls (e.g., worker training), and personal protective equipment.

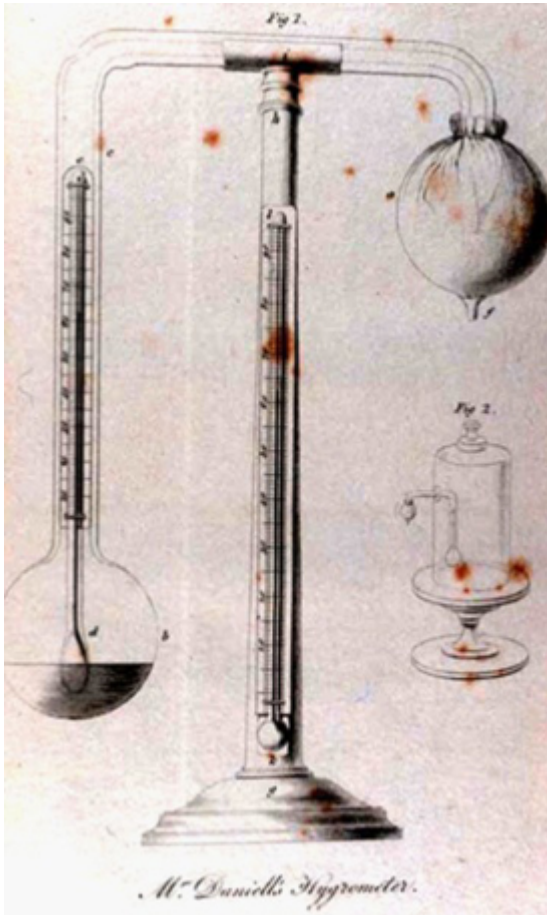
As a result of the Ring of Fire, the Industrial Revolution is starting at least a century ahead of schedule, and will occur at a much accelerated pace. This will dramatically increase the risk of workplace accidents and occupational diseases. Fortunately, the up-timers can also educate the down-timers as to how to improve occupational safety.

Hazard Monitoring

We need to have ways of quantifying conditions in order to determine which workplaces are unsafe, and how good a particular safety technology is at mediating the hazard. (A hazard measuring device, when

coupled to some kind of signaling means, becomes a warning device.)

Heat and Cold. Simple thermometers are already known (in 1629, Delmedigo described a sealed glass thermometer with brandy as the expandable liquid), and temperature scales appeared by 1613) but as of the RoF, scales weren't standardized, and the thermometers were pressure sensitive. These problems will be solved quickly.



Humidity. Crude hygrometers were known before the RoF. Two thermometers, one with a wet bulb and the other a dry bulb, can be combined to make a hygrometer.

Air movement. The modern cup anemometer is a simple mechanical design and should be duplicated fairly quickly. In fact, I think I put one into "Stretching Out, part 4."

Dust. Collect dust on filter, then weigh.

Noxious gases. Quantitative gas analyzers are largely beyond early post-RoF capabilities. We are essentially back to the "miner's canary" level of monitoring. Old mining books speak of detecting "fire damp" (mixture of methane and air) by observation of how it affects the operation of the Davy "safety lamp"; of "white damp" (carbon monoxide) by brightening of the flame of an ordinary lamp; "black damp" (carbon dioxide) by the reduction of such a flame, or by reaction with lime water or litmus paper; and "stink damp" (hydrogen sulfide) by its smell. (*Treatise on Coal Mining*, 1900).

Noise. Most common sound measuring devices measure the pressure exerted by a sound and convert it into an electrical signal. I am not aware of any pre-RoF sound monitoring devices. The first practical device was the carbon button microphone (1870s) connected to a current meter. These should be fairly straightforward post-RoF introductions.

There is enough up-time audio equipment in Grantville to set up a testing lab for noise protection devices. Nothing fancy; we hook up a microphone to an amplifier or other device with a VU meter. That's our detector. Next we need a reference sound source. This might be a cassette player, with a speaker, playing a "standard" tape. We separate the speaker and mike by a "standard" distance, and check the VU meter readings with and without the test material covering the speaker. If the sound is so muffled that it doesn't stir the meter, we can move the speaker closer and then apply the rule that the sound intensity is inversely proportional to the square of the distance.

This is not, of course, a method which would be acceptable in a modern acoustics laboratory. But it is way beyond anything the down-timers had.

Ultraviolet radiation. The ideal UV meter would be a photoelectric device, based on silicon carbide or aluminum nitride, or perhaps a gas-filled tube. Laboratory UV detectors are unlikely to be available in Grantville. Some fire detectors are sensitive to UV-B and might be adaptable to goggle testing use.

There are probably sources of UV light in Grantville. These will mostly be sources of long-wave UV, the "black light" tubes used for shows and so forth. However, rockhounds and geology classes may have short-wave UV lamps.

Next we need a detector. It could be an up-time "glow-in-the-dark" decoration. Or it could be a fluorescent mineral, from an up-time rockhound collection, or found fortuitously after the RoF. Again, it is probably easier to find materials which fluoresce strongly when exposed to long wave UV. In essence, we are looking for glasses which, interposed between the light and the fluorescent material, prevent the fluorescence by blocking the light.

Safety Assurance

Safety is assured by three different means: engineering controls, administrative controls, and personal protective equipment.

Engineering Controls

Engineering (environmental) controls are facility, process and machinery changes which reduce exposure to hazardous conditions. They can modify operating conditions so that the hazard is less likely to arise, less severe when it arises, or more quickly dispelled. Or they interpose a barrier between the worker and the hazard. Finally, they can at least give warning that a hazard has increased, so workers can don protective equipment, leave the work area, or take corrective action.

Engineering controls of the first category include

—use of safer raw materials (e.g., eschewing lead and mercury).

—wetting systems to control dust

—assuring adequate lighting, temperature control, ventilation (vents, fans, and fume hoods), and waste disposal

—designing machinery controls ergonomically to reduce repetitive stress injuries.

Barriers take several forms. First, there is the process enclosure; the potentially hazardous process is conducted inside a closed environment, so that exposure occurs only during raw material replenishment, product removal or maintenance, or if it a leak occurs. A variation on this is one in which the process is partially enclosed, and workers pass in and out of a controlled access point designed to mitigate the escape of hazardous materials into the larger environment. If the hazard is stationary, like a machine workstation, then it is sufficient to keep the worker out of harm's way by means of a guard rail or safety interlocks.

Secondly, there is the operator enclosure; the worker is placed in a protective control room or cab.

Thirdly, there can be mobile barriers, usually linear, that can be placed in the likely propagation path of the hazard. For example, one can place heat shields, steam curtains or air jets in front of radiant heat sources.

Warning devices include leak and smoke detectors.

Engineering controls may have existed earlier (e.g., shoring up the ceiling in a mine, but they became more common in the nineteenth century: white phosphorus matches were banned in Denmark in 1872 (Emsley); machinery guards were required by Great Britain, and ten American states, by 1897 (MacLaury).

* * *

Ventilation. Natural ventilation is achieved by providing permanent openings to the outdoors, or by opening doors, windows and vents. Engineers need to worry about making these easy to open and close (especially if out of reach), and making it easy for air to pass through them (e.g., by aiming the vent or adjusting a window wing). Exhaust pipes can be equipped with deflectors to increase draft. Equipment is arranged so as not to obstruct airflow.



Artificial ventilation is designed to exhaust (or clean) contaminated air, or to bring in fresh air. It will probably involve some kind of fan and there may also be a filter to remove dust.

If the hazard is localized, an exhaust hood may be positioned above the source, an air douche may be used to blow fresh air at the exposed worker, or an air curtain can prevent air exchange between the contaminated area and the work zone proper.

Heating. Heating systems can be central or local, and will probably involve circulation of heated air, hot water or steam. These pose hazards in their own right.

Illumination. Natural illumination can be provided by windows or skylights. The introduction of a better quality of glass will increase light transmission. Natural illumination is often problematic if there is a need to control temperature. Night work indoors, of course, necessitates artificial illumination.

Artificial illumination as of RoF took the form of torches and lanterns, which in turn presented fire hazards. In OTL, subsequent developments include the gas lamp (1792), electric carbon arc (1809), limelight (1826), kerosene lamp (1853), electric filament lamp (1870s), mercury vapor lamp (1901) and fluorescent lamp (1937). Electrical illumination will require either batteries or a power generation and distribution system.

Reflectors can be used to make more efficient use of the available light sources.

Noise Reduction. Obviously, you can say that factories are already loud; if it bothers the worker, let them wear earplugs.

But the other approach is to reduce noise generation and transmission by various engineering expedients.

You start by eliminating noise at the source. Noise can be abated by use of equipment substitution (presses instead of hammers, belt drives instead of gears, "mute" plastic contacts instead of metal ones, rotating rather than reciprocating mechanisms), process substitution (non-percussive processes instead of percussive ones, welding instead of riveting), preventative maintenance (lubrication, replacement of worn-out parts), and anti-vibration design (lower rotational speeds, vibration dampers, altering the vibrating member).

If that isn't enough, you need to reduce sound transmission (soundproofing rooms, placing individual machines in enclosures, baffling equipment). Soundproofing involves the reflection or absorption of sound. It can be done locally (a machinery enclosure) or more generally (a wall between a noisy room and the rest of the factory).

Administrative Controls

These control who performs the work, and when and how. One might think that workers would logically do the work in the safest possible way, unless required by supervisors to do otherwise, but that ignores economic realities. During the nineteenth century, payment on a piecework basis encouraged workers to adopt unsafe practices if it would speed up their work. For example, nailers didn't wet down their cutting machines to reduce dust, because dry cutting was faster. (Sellers 26).

Administrative controls begin with screening prospective workers to make sure they have the mental and physical capacity to perform the work without special risk. The workers may have to meet minimum age or height requirements, and be free of lung or heart disease, or back trouble, or particular allergies. After hiring, they may be required to undergo periodic medical checkups to make sure that they are still fit. This surveillance will also spot deterioration of health as a result of exposure to workplace hazards, expected or unexpected.

It is important not to leave the examination to worker discretion. Even in the nineteenth century, peer pressure, as much as job competition, discouraged workers from taking time off from work because of occupational disabilities. (Sellers 23). Physicians were consulted only once the worker was seriously ill. This wasn't just a matter of economics; the competence of doctors was questioned (24).

When the company physical was first introduced, there was considerable worker resistance. The workers believed that the exams were a subterfuge, used to "weed out union sympathizers from the workplace." Or at the least, that the company would refuse employment to the old or infirm merely because of the "compensation risk" they posed. (119). The burden on government and industry will be to persuade workers that the examination is to their ultimate advantage. Even — or perhaps especially — when the employee is on the slippery slope of some occupational disease (24).

Once the worker is on the job, work rules (or laws) limit the number of hours worked each day, and the length and frequency of rest breaks. The employees may be rotated in and out of particularly hazardous assignments to give their bodies a chance to recover from unavoidable exposures.

Administrative controls also include worker training in how to perform the work and how to respond in an emergency, signage to remind the employees, and penalties for lapses. In a steel plant, workers might be required to drink plenty of liquids to reduce heat stress. (Given that Grantville is now in Thuringia, Germany, I suspect that the liquid imbibed will be beer, not water.)

Personal Protective Equipment (PPE)

The most obvious means of protecting workers is to armor them in some way against the hazards, whether they be physical, chemical or biological. OSHA considers this to be the final line of defense, and would prefer that the hazards be minimized by other means first.

Let's review the issues and options, from head to toe. Before we get into the details, one caveat: don't use this article as a guide to what is appropriate personal protective equipment in the modern workplace!

* * *

Head Protection. Soldiers have worn helmets since ancient times, to protect them from inconsiderate blokes swinging maces in their direction. The "hard hat" is the construction workers' standard head protection. The original ones, patented by Bullard in 1919, was made from steamed canvas, glue, and paint. They were called "hard boiled hats" because that is exactly how they were made. Later models were made of aluminum, fiberglass or plastic.

Hard hats consist of a hard shell and a resilient suspension. The shell helps spread the shock over a larger area, and also flexes a bit to absorb some of the impact energy. The suspension elevates the shell so it is not in direct contact with the top of the worker's head. Since the suspension is made of an elastic material, it absorbs more of the impact, as it grudgingly compresses in response to the blow. If the shell still is forced down against the skull, at least it will be moving more slowly.

In the 1632 universe, we can certainly make hard hats. The main disadvantage is that these are likelier to be heavier and hotter than their up-time counterparts. For several years, at least, the shell will be metal, not plastic; the suspension, leather or fabric, rather than nylon.

Hard hats were one of the first up-time articles to be closely inspected by down-timers. In Douglas Jones, "Schwarza Falls" a down-timer reported to his lord: "... one of the men let me try on his helmet. It was very light compared to what I expected, not metal, but something much lighter and yet harder than leather. The helmet did not rest on the head, but was supported away from the head on a clever network of straps. I feel that a blow to the helmet would not be felt directly, not with those straps in place."

* * *

Ear Protection. Ear protection dates back to Homeric times. After all, Odysseus had his crew put wax in their ears, so they couldn't hear the seductive song of the sirens. Ornamental earplugs, made of clay, ivory, amber, glass, and metal, are known from archaeology.

The loudness (power) of a sound is stated in decibels, compared to a reference sound level. If sound A has a level which is 10 decibels higher than sound B, then A is ten times the power. A twenty decibel difference would imply that A was *one hundred* times the power. And so on. If the threshold of human hearing is called zero decibels, then a sound which is 70 decibels, or louder, is capable of causing harm, at least after prolonged exposure. According to EPA and NIOSH, safe exposure is limited to 24 hours at 70 decibels, 8 hours at 85 decibels, and 2.5 hours at 90 decibels. The acute pain threshold is 130 decibels; eardrums rupture at 190 or so decibels; 200 decibels can kill.

The sound power is proportional to the square of the sound pressure (what the monitors actually measure), so a tenfold increase in power corresponds to a 3.16-fold change in pressure. Our subjective perception of loudness is a function of intensity, duration and even frequency. A tenfold increase in power corresponds to roughly a doubling of the loudness.

By way of comparison, a vacuum cleaner at one meter produces 80 decibels, a loud factory, 90; a jackhammer at two meters, 100; a rock concert, 120; a fired rifle at one meter, 140.

The standard personal protection against industrial noise is the earplug. A cord comes in handy for pulling the plug out of the ear canal. Modern earplugs are made of foam (polyvinyl chloride or polyurethane), and reduce noise levels by 25 decibels. A heavier-duty alternative is the around-the-ear acoustic earmuff, with additional sound-attenuating material.

Foam isn't going to be readily available (until we restart the plastics or rubber industry), but cloth earmuffs should do. Again, the problem is that they are going to be bulky and hot. The ideal material is the one which provides the most sound absorption for the least weight. In general, the best materials are likely to be those which have a complex porous structure in which sound can be trapped, as it is in foam.

Most of the published data on sound absorption relates to building materials, and those are given a noise reduction coefficient (the average of the absorption coefficients at frequencies of 250, 500, 1,000 and 2,000 Hz). The frequency range of human hearing is about 20 to 20,000 Hz.

* * *

Eye Protection. Even in modern America, there are about two thousand eye injuries in the workplace every day. Sixty percent occurred to workers without any eye protection, the other forty percent to those wearing inadequate protection (usually eyeglasses without side shields).

According to a 1980 BLS study, about 70% of the accidents are caused by flying or falling objects, and about 60% of these were smaller than a pinhead. Some operations naturally produce dust or chips. Dangerous fragments can also be generated by explosions and breakage. Another 20% of the eye injuries were the result of contact with chemicals.

If the hazard is purely mechanical, then the key concerns are impact resistance and coverage. By coverage, I mean that you are protected against attack from the flank as well as the front.

With radiation, the intensity of the radiation has to be reduced to tolerable levels, without completely blocking your view of the workplace.

Safety glasses and goggles are the primary eye protection. Goggles are better because it is more difficult for the particles or chemicals to get around them. Face shields may be added to provide an outer line of defense, and also protect the face.

Any eye protection must be transparent, which pretty much limits the choice of material to glasses and plastics. Until we rebuild the plastics industry, we will have to use glass. That is unfortunate, because polycarbonate has about ten times the impact resistance of hardened glass.

Case-hardened (fully tempered) glass is ordinary soda lime glass which has been heat-treated so that the surfaces cool before the interior, the surfaces thus being forced into compression. Its missile resistance is about twice that of ordinary glass (measured as the impact velocity causing fracture). If the glass does break, it "dices" into small fragments with rounded edges.

A second kind of safety glass is wire glass, essentially, sheet glass with an internal metal mesh. It is used mostly in fire doors and the like, because the glass remains in place even when cracked by the heat of a fire.

Neither is anywhere near as good as polycarbonate. So we will have to compensate by using thicker lenses. What about "bullet-proof glass," you ask? It is actually a laminate of glass and polycarbonate.

Testing for impact resistance is straightforward. You start with a drop test. The ANSI standard is a one inch diameter steel ball dropped at 50 inches. If it passes that test, you move up to the high mass impact test, which uses a pointed projectile weighing 500 grams, dropped from the same height. And then there is a high velocity impact test — a quarter-inch steel ball traveling at 150 feet per second.

Some types of work, such as welding, require that the lens filter incoming light. The light can be visible light, or of wavelengths shorter (ultraviolet) or longer (infrared) than those which we can see. (We will ignore X-rays in this article.)

OSHA considers ultraviolet radiation to be the most dangerous of the three radiation components, as it can burn the skin, and damage the lens of the eye. Intense visible light can dazzle the welder, resulting in dangerous errors, and retinal damage can be experienced in extreme cases. OSHA considers infrared to be the least dangerous, although it can heat the skin and subcutaneous tissues, resulting in burns.

The degree to which a filter absorbs visible light is expressed as a shade number. A SN 8 filter blocks 99.9% (all but one thousandth) of the light, while SN 15 blocks all but one-millionth of it. According to MrEclipse.Com, smoked glass has a shade number of 11.6. Its transmittance of infrared was 0.639%, near UV 0.00054%, and farther UV 0.00032%. However, the site warned that it is difficult to produce a nice, thick coating, and that it rubs off easily. In contrast, a standard Welding Filter Shade 12 had a shade number of 11.9, infrared transmittance 0.0049%, near UV .000035%, and further UV .000039%.

It may be possible for 163x glassworkers to apply a protective surface coating to smoked glass. Another possibility is to produce a strongly colored (perhaps "black") glass.

What about the other forms of radiation? The good news is that garden variety soda lime glass is going to strongly absorb short wave UV and far infrared light (beyond two microns). The bad news is that, without modern equipment, it isn't easy to measure just how much "invisible" radiation a given piece of glass absorbs.

There are modern safety glasses in Grantville; for example, in Nat Davis' machine shop. (Cresswell and Washburn, *When the Chips are Down*, ROF1). These will be used when the down-time equivalents just

aren't safe enough, and they will also come in handy as "gold standards" for testing purposes.

There is one other approach to eye protection that I need to mention: the reflective coating. The disadvantage of absorbing light is that the energy is converted to heat, which can crack the glass. So why not silver the surface of the glass, using a coating that is just the right thickness to reduce the light to tolerable levels, while permitting the workpiece to be seen? Well, it sounds good in theory. In practice, it may be difficult to control the thickness of the film, and then to protect it from abrasion and chemical reaction. Another problem is a phenomenon called the "ultraviolet transparency of metals"; in essence, metals which reflect visible light may be quite transparent to ultraviolet light.

* * *

Nose/Lung Protection. Many industrial processes result in the emission of gases or dusts which it is dangerous to breathe in. The final line of defense against these threats is the personal respirator. One type purifies the air; the other supplies breathable air. It may be self-contained (like SCUBA for divers), or hooked up to a fixed reservoir.



Respirators will have a tight-fitting "face-piece" which at least covers the mouth and nose (quarter-mask), and may reach under the chin (half-mask) and even up to the hairline (full-facepiece). The facepiece needs to be impervious to vapors, and, if it covers the eyes, also have a "window" to see through. Modern facepieces are usually made of rubber, plastic or silicone. However, in the 1632 universe, we may need to make do with leather, or some kind of coated cloth.

Respirators intended to fend off dust will have some kind of particulate filter. Absolute protection is provided if the pores are smaller than the particles. But there's a trade off here; the smaller the pores, the less the airflow, and the more trouble it is to breathe. Most respirator filters trap particles by forcing them onto convoluted paths, on which they collide with fibers, or just settle on to them. Filters can be electrically charged to help them capture particles with the opposite charge. The most common particulate filter is a disk of "random laid, non-woven fiber material." In essence, a felt (which people have made since 6,500 BC).

Protecting against dangerous gases is trickier. The respirator needs to provide a purifying agent, which can be an adsorbent or a neutralizing agent. The most common adsorbent in current use is activated

charcoal. *Encyclopedia Americana* says that it is "produced by heating animal bones or certain types of vegetable charcoal to temperatures of 800 to 900 oC (1470-1650 oF) in steam or carbon dioxide. This treatment results in the formation of a highly developed internal pore structure with a very large surface area...." It is usually granulated. Other adsorbents include fuller's earth (a clay), activated alumina and silica gel.

The adsorbents can be chemically treated to increase their affinity for particular gases, for example, iodine treatment to remove mercury vapor. This is not likely to be discussed much in the encyclopedias and textbooks, but it may be mentioned in the manual for a particular respirator which contains such an adsorbent.

Neutralizing agents are specific to a particular chemical threat. For example, if the worker is going to be exposed to acid gases, the respirator can be charged with sodium or potassium hydroxide, perhaps combined with lime to increase absorption.

The respirator can also provide a catalyst. Hopcalite is "a mixture of porous granules of manganese and copper oxides which speeds up the reaction between toxic carbon monoxide and oxygen to form carbon dioxide."

The protective agent can be stored in a small cartridge, mounted directly on the facepiece, or in a larger cannister, connected to the facepiece by a tube. Cannisters can be chin-, front- or back-mounted. The higher the concentration of the gas, the more likely it is that you will need a cannister-based design.

I am not going to review air-purifying respirators, other than to say that it is in Canon that there are people with SCUBA apparatus (1633, Chaps. 29, 34).

* * *

Skin Protection. Skin may need to be protected against points and edges, flying debris, chemicals (liquid and gaseous), heat or cold.

The hands are usually the most vulnerable part of the body, since they are operating machinery or manipulating the workpieces. Gloves, mitts and the like have been used since time immemorial. To guard against slashes and punctures, chainmail comes in handy, and of course chainmail manufacture is a well-established trade in the 1630s. If you need to prevent burns or frostbite, then you need an insulated glove. Basic oven mitts and pads are readily available in Grantville. and can be copied. The most problematic threats are the chemical ones, for which the modern worker would prefer a latex glove.

Other parts of the body can also be vulnerable, and hence there will be a demand for aprons, hoods, and so forth.

* * *

Foot protection. Safety boots have a steel "toe", as that's where you're most likely to drop a workpiece. Soles will at least be skid-resistant, and may contain steel to protect against puncture. For particular industries, it may be important that the boots are impervious to chemicals, or electrically insulating.

The safety boots are likely to be made, initially, of leather, although I expect that rubber would be preferred. Curiously, the 1911 EB says that wooden clogs were preferred by agricultural and forest laborers, dyers, bleachers, tanners, and workers in sugar factories, chemical works, provision packing warehouses, etc.

* * *

Heat protection. Heat protection can take a number of forms, such as aluminized or asbestos clothing. Asbestos, of course, presents its own hazards, and aluminum is hard to come by. We will probably be making do with wool, possibly wetted down.

* * *

Fall protection. "Schwarza Falls" also mentioned the use of "safety ropes" to arrest a fall. Some up-timers should be familiar with modern safety harnesses for building construction and maintenance.

* * *

Miscellaneous. Just in case you need to be rescued, it's prudent to be wearing conspicuous clothing. In "Schwarza Falls", guard officer Franz Saalfelder reported that each of the three up-timers he met on May 19, 1631 (Julian) was wearing "a yellow helmet and an orange vest; the orange color was unnaturally bright."

Summary Table

The following table summarizes typical hazards and the corresponding safeguards.

Hazard Safeguards *dust and noxious gases* dust control in machinery design, isolation of dusty or gas-producing processes, air filtration or neutralization, ventilation, respiratory protection **heat and cold** shielding of radiant sources, insulation, protective clothing, air conditioning, air douche, enforced rest in refuge **Light** baffles, filter windows, goggles, eye rest **Vibration** static and dynamic balancing of equipment; operation outside of resonance regions; frictional and viscous damping; elastic connections; shock absorbing soles **Noise** reducing noise generation; soundproofing; ear protection **electricity** guards to allow inspection without contact; emergency disconnects; first aid training; low voltage systems; distancing of naked conductors; insulation; grounding; protective equipment (dielectric gloves and boots; insulating tongs, mats); lightning protection **pressure vessels** inspection; pressure and temperature gauges; safety valve; **Fire** fire drills; fire fighters; access road to buildings; water supply; fire-resistant structures (overall and fire stops); fire exits and refuges; fire extinguisher; sprinkler systems **machinery** guards; interlocks; safety catches; screens; ergonomic controls; grounding; chip/dust collection and disposal; limits on required force; hoists; hand signals

Special Hazards

There are a number of industries which are prominent in the 1632 universe and which present special hazards which deserve discussion.

Mining Safety

The subject of mine safety was briefly addressed in Laura Runkle's *Mente et Malleo* (GG2): "By 1632, there had already been several notable mining disasters. Usually the resulting [safety] rules did not involve the safety of individual miners, but rather the safety of the whole mine—drainage, ventilation, and the placement of tunnels and shafts."

There is no doubt that this is an issue on which the Grantville miners will have a lot to say. They also have firsthand experience with uptime mine safety equipment. Grantville even has a resident mine safety engineer, Ron Koch. (DeMarce, *Rudolstadt Colloquy*, GG1).

Despite that expertise, by January 1635, the Grantville coal mining fraternity had already experienced its first post-RoF mine disaster. See Mark Huston, "Twenty-eight Men" (*Grantville Gazette* volume 10).

* * *



In seventeenth century mining, the principal threats to life would have been rock falls, and methane and coal dust explosions.

Inadequate lighting, ventilation, and temperature, noise and dust control would also have resulted in accidents and chronic health problems.

Room-and-pillar mining, in which pillars of rock are left standing to support the roof, is very old, and there would also be artificial roof supports. However, in the seventeenth century these supports would still have been made of wood, and there was no scientific method of determining the spacing or diameter of the supports. Modern miners use machines to place bolts into the roofs.

The most primitive method of detecting carbon dioxide was to take a canary underground. If the canary suffocated, it meant that ventilation was inadequate.

Ventilation initially was simply provided by (if you were lucky) digging ventilation holes. Later, furnaces were used to heat air and generate a draft. Still later fans were introduced, both above and below ground, but bear in mind that improved ventilation was not completely a blessing because the increased air movement could stir up coal dust.

Safety lamps were introduced in 1815. They were used, not just to provide light, but to detect the presence of methane (which would cause the lamp to burn brighter). However, they could cause an explosion, rather than forestall one, if the miners disassembled the lamp, removing the protective wire mesh surrounding the flame.

Primitive black powder explosives were replaced by more stable ones such as dynamite (remember, Nobel thought he was benefiting mankind).

Mines have also introduced fireproof ropes, "escape capsules," and "self-rescuers." The latter can convert carbon monoxide to carbon dioxide, or supply oxygen.

* * *

In Grantville, coal mining will continue to make heavy reliance on powered equipment, but operations elsewhere will be manual for some time to come, and hence will have a somewhat different spectrum of accident causes. Nonetheless, it is worth reviewing late twentieth century accident statistics.

According to the Mine Safety and Health Administration statistics for 1986-95, in coal mining, fatal injuries occurred when using or operating tools or machinery (27.6%), constructing, repairing or cleaning (23.7%), during vehicle/transportation operations (19%), while handling materials (11%); or during other activities (18.8%) (Table 4-4). The death was most often the result of fall of ground (31.7%), followed by powered haulage (23.1%), machinery (16.6%), electrical (8.2%); ignition/explosion of gas or dust (6.1%).

The leading cause of fatal injuries in modern coal mining is "fall of ground" (31.7% in 1986-95). In 1996-98, roof, rib and face falls resulted in nearly half of the underground fatalities. "Ground control" includes testing roof rock quality and providing adequate roof support, escape paths, signage so miners don't wander into areas of unsupported roof, and fall warning devices. Small falls also cause nonfatal injuries, which can be mitigated by personal "bolter screens."

Pillar recovery (taking out support pillars of rock as you retreat out of the mine, allowing the roof to collapse behind you) is particularly dangerous.

The second most important cause of coal mine fatalities is "powered haulage" (23.1%), the horizontal transport of workers, coal, supplies and waste by a variety of vehicles. Accidents can occur during entry, exit, operation or maintenance. Miners can be run over or pinned by the equipment.

Machinery poses the third biggest threat to life (16.6%). The risks, and preventatives, are those typical of factory machinery.

In fourth place, we have electrical (8.2%). Almost half of the electrocution deaths occur during maintenance and repair. Overhead power lines have been involved in many electrical accidents involving mobile mining equipment. Precautions could include some kind of power line proximity warning system, and simple methods of disconnecting all electrical circuits within an electrical enclosure.

While ignition or explosion of gas or dust is the cause of death most likely to result in coverage on the national news, it ranked only in fifth place (6.1%) according to the cold statistics. In part, its media prominence is because these incidents can result in multiple fatalities. It was the 1951 explosion at Orient No. 2, in West Frankfort, Illinois, that prompted the enactment of the Federal Coal Mine Safety Act.

The dangers are controlled by gas and dust monitoring, ventilating the mine to remove gas and dust, adding rock dust to inert the coal dust, eliminating ignition sources, isolating worked-out areas with seals, and placing barriers where they can intercept a blast.

The remaining causes of fatal injuries include explosives/breaking agents (2.9%), falling/rolling/sliding material (2.9%), and slip or fall of person (2%) (with 6.3% unclassified) (IIAHE, Table 4-5 and Figure 4A-4). The unclassified causes would have included exploding pressure vessels, fires not otherwise accounted for, hand tools, hoisting equipment, failure of an impoundment, and inundation.

The leading causes of nonfatal injuries were handling materials, slips/falls, and hand tools.

Coal miners are exposed to respirable dust, machinery noise, and other stresses. Not surprisingly, they suffer a variety of chronic illnesses, including coal workers' pneumoconiosis (66%), hearing loss (20%),

repetitive trauma (7%), and heart attack (2%) (IIAHE Fig. 5-1).

Chemical Plants

By December 1633 post-RoF, Magdeburg had a coal gas plant. There, coal was cooked in a furnace, producing coke, coal gas and a residue. Unlike coal, coke can be burnt with little smoke, making it useful for railroads. It also is used as a fuel and reducing agent in the blast furnaces of steel plants. The coal gas was burnt in Magdeburg as a fuel and illuminant. The residue (loosely speaking, "coal tar") can be separated into pitch, light benzoils, and other hydrocarbon fractions.

In Chapter 2 of Eric Flint's *1634: The Baltic War*, a grate was imprudently removed from the coal chute, the gas main leading out of the coal gas plant got blocked by tar and coal dust, gas backed up into the furnace, and the coal in the furnace caught fire (as opposed to being merely charred to form coke).

The fire brigade sprayed water onto the smokestacks, trying to bring down the temperature and put out the fire. In retrospect, this was not a good idea. The water dissolved the firebrick in the reverberatory furnace, and reacted with the coal to form hydrogen and carbon monoxide. Air mixed with the coal gas, too. The result was a double explosion. Actually, a triple one; once the fire reached a shed used to store fertilizer — ammonium nitrate.

Even without an explosion, working with coke ovens can be dangerous. Because the coal is heated to at least 2000 degrees F, coke oven workers must be concerned about heat stress. The coking operation should be a closed system, but a leak can occur, exposing the operators to various noxious dusts and gases — some of which also are flammable.

The coal gas plant explosion in Magdeburg was probably the most dramatic chemical plant accident in canon, but it is not the only one. Hydrofluoric acid — possibly the nastiest of the commonplace industrial chemicals — got on the skin of one of Dr. Phil's laborants, resulting in the emergency amputation of an arm. See Kerry Offord, "Dr. Phil's Family" (*Grantville Gazette*, Volume 10).

The number of different chemicals which might be manufactured in the USE is enormous. Hence, this discussion will be a general one.

Chemical raw materials are usually supplied as powders or liquids. The powders have to be transported to the plant in containers which minimize leakage. The containers may need to be sealed to keep out air, or even filled with nitrogen or carbon dioxide.

The contents of the individual containers must be transferred to a storage silo, and from there, to the reactor. These transfers should be performed, as much as possible, in closed systems, because each open transfer is an opportunity for release of dust. In addition, there can be a static charge buildup, which creates a risk of fire or explosion.

The preferred transfer mechanism is probably pneumatic. If that is beyond the technological capacity, then we will want to at least provide local ventilation.

Liquids will also be delivered to the plant. The most common ones are solvents (acetone, toluene, methylene chloride, isopropyl alcohol) and mineral acids (hydrochloric acid, sulfuric acid, nitric acid). The liquids will be directed into storage tanks and subsequently to the reactor.

Again, a closed system is desirable, to minimize vapor release. Ideally, the transfers are by permanent,

hard-piped lines. If the operation is not of a scale which favors dedicated lines, and pipes must be moved around depending on the chemical being produced, then there will be an opportunity for chemical release whenever lines are disconnected or reconnected.

Obviously, it is important to maintain the lines to ensure that leaks don't develop. Also, piping connections can be shielded with jackets for further protection.

Storage tanks are preferably above ground, to make it easier to inspect them, and should have some kind of leak detector. Liquid chemicals can be transferred into the reactor by some kind of pump. A steam ejector can be used to create a vacuum in the reactor to suck in the chemical.

Chemical plants also need to handle gases, such as ammonia and chlorine. Obviously, the tanks and lines need to be impervious to the gas, and unreactive with it.

The reactor will need to be chemically resistant (e.g., glass lining), equipped with temperature controls and a sampling port, and built to withstand pressure. As a second line of defense against overpressure, the reactor will have a vent sealed with a rupture disk (probably made of graphite), and leading to a containment tank. To protect against fire, the headspace of the reactor can be filled with an inert gas, usually nitrogen or carbon dioxide.

Liquid-solid separations typically involve cakes with a large surface area, and hence there will be an opportunity for solvents to evaporate. Solvent vapor exposure can be controlled by local ventilation.

Insofar as providing chemically resistant vessels is concerned, we will want to recreate borosilicate glass (see Cooper, "In Vitro Veritas," Grantville Gazette 5) and various steel alloys. For secure tubing, rubbers (see Cooper, "Bouncing Back," Grantville Gazette 6) and plastics are important.

In Grantville, there is ample electricity to run electrical fans, but elsewhere, fans and pumps are likely to be steam-driven.

Steelmaking

Coke, iron ore and limestone are fed into the blast furnace, where they are heated to over 3000°F. Either air (Bessemer process) or pure oxygen are blown through the molten iron. Dangers include intense radiant heat, spills of molten metal (which, if it comes into contact with a wet surface, causes a sudden and highly explosive release of steam), carbon monoxide generated by the furnace, noise, and unpleasant encounters with moving equipment. (USW; Burgess).

Metal Fabrication



In a foundry, molten metal is poured into a mold, and allowed to cool, creating a metal article of a desired shape. Hazards include noise, vibration, heat stress, and exposure to silica dust (from the foundry sand used to make the mold) and carbon monoxide.

Metals are machined with various cutting and grinding tools. In Virginia DeMarce's "'Til We Meet Again" (*Grantville Gazette*, Volume 4), we witness the dangers of an airborne power saw.

Then there is forging, which reforms a metal by impact or pressure. In Karen Bergstrahl's "Tool or Die" (*Grantville Gazette*, Volume 9), the villain is a drop forge. While being caught by the drop hammer is the most obvious hazard, forging was one of the first industries identified as posing a threat to hearing. Hammer operators can expect to experience sound levels of as much as 108-dB. (Burgess 103).

Conclusion

All too often, safety legislation has been prompted by tragedy. The 1911 Tringle Shirtwaist Fire, in which over 140 workers jumped to their deaths, prompted New York's first building safety code. In the wake of the disaster, New York formed a Factory Investigating Commission, which in turn secured enactment of twenty state occupational safety and health laws.

It is true that during the first decade following the Ring of Fire, the number of industrial workers will be small compared to late nineteenth century America or Britain. However, that will change. The up-timers are making a concerted effort to raise the USE (and Sweden) to a nineteenth century economic level.

They must "gear-up" despite the fact that the educational level of the early seventeenth century USE and Sweden is substantially lower than that of the nineteenth century models. They need to do this quickly, to satisfy war needs. And the technology they are trying to recreate is one which they may know only from books, not from experience.

Accidents are inevitable. The question is what level can we tolerate without causing a reaction which

endangers, not only the industrial revolution, but also the political one—the "second American Revolution."

Bibliography

Legal and Social Framework; Pre-Regulation Accident Rates

Maclaury, "Government Regulation of Workers' Safety and Health, 1877-1917,"
<http://www.dol.gov/asp/programs/history/mono-regsafetrotoc.htm>

1911 Encyclopedia, "Labour Legislation"

Harger, Workers' Compensation, A Brief History, <http://222.fldfs.com/wc/history.html>

Seager, *Social Insurance: A Program of Social Reform* (1910), Chapters II (accident prevention) and III (compensation).

Stein, Priestly v. Fowler (1837) and the Emerging Tort of Negligence,
http://www.bc.edu/schools/law/lawreviews/meta-elements/journals/bclawr/44_3/01_TXT.htm

"Factory Laws," Wikipedia

Gies, *Life in a Medieval City* (1969)

Lynch, *Mining in World History*

Emsley, *The Shocking History of Phosphorus: A Biography of the Devil's Element* (2000).

Franco, "Ramazzini and workers' health," *The Lancet* , 354:858 (Sept. 4, 1999), online at
<http://www.collegiumramazzini.org/>

Murphy, Life Insurance in the United States through World War I,
<http://www.eh.net/encyclopedia/article/murphy.life.insurance.us>

Aldrich, History of Workplace Safety in the United States, 1880-1970,
<http://www.eh.net/encyclopedia/article/aldrich.safety.workplace.us>

US Dept Labor, The Job Safety Law of 1970: Its Passage was Perilous

<http://www.dol.gov/asp/programs/history/osha.htm>

John Marsh, on "Report to the Stockholders" (1925)

http://www.english.uiuc.edu/maps/poets/a_f/beecher/stockholders.htm

Book Review, of SAFETY FIRST: Technology, Labor and Business in the Building of American Work Safety, 1870-1939 MARK ALDRICH, 1997 Baltimore and London: Johns Hopkins University Press

http://www.findarticles.com/p/articles/mi_m0348/is_n2_v39/ai_20951195

"Scaffold," 1911 Encyclopedia Britannica,

<http://21.1911encyclopedia.org/S/SC/SCAFFOLD.htm>

BOPCRIS, Browse: Factory laws and legislation

<http://www.bopcris.ac.uk/browse/LCSH/866.html>

Key dates in Working Conditions, Factory Acts, Great Britain 1300-1899

<http://www.thepotteries.org/dates/work.htm>

Summary of Factory Acts in the 19th Century UK

<http://www.angryharry.com/refactoryacts.htm>

Factory Legislation 1802-1878

<http://www.dialspace.dial.pipex.com/town/terrace/adw03/peel/factmine/factleg.htm>

ROSPA [Royal Society for the Prevention of Accidents] in the Twenties

<http://www.rospa.com/history/1920s.htm>

(discusses the "Safety First" campaign)

Scottish mining accidents

<http://gdl.cdlr.strath.ac.uk/haynin/haynin1204.htm>

Tuohy, Interurban Railroaders and Changing Work Conditions on the South Shore Line, 1908–1938

http://www.indianahistory.org/ihs_press/web_publications/railroad/tuohy.pdf

Innes, "Origins of the factory acts..." in Landau, Law, Crime, and English Society, 1660-1830 (2002).

Sellers, *Hazards of the Job: From Industrial Disease to Environmental Health Science* (1997).

Hazards; Safety Technology

Poltev, *Occupational Health and Safety in Manufacturing Industries* (1985)(used frequently but not specifically cited)

Woodside, *Environmental, Safety and Health Engineering* (1997)

OSHA, Fact Sheet No. OSHA 92-03, Eye Protection in the Workplace

<http://www.pp.okstate.edu/ehs/training/oshaeye.htm>

NIOSH, Eye Safety

<http://www.cdc.gov/niosh/topics/eye/>

Sliney, OCULAR HAZARDS OF LIGHT

http://ncr101.montana.edu/Light1994Conf/4_2_Sliney/Sliney%20Text.htm

Elvex, "How Strong is Polycarbonate,"

<http://www.elvex.com/how-strong-is-polycarbonate.htm>

NIOSH Guide to Industrial Respiratory Protection (Sept. 1987),

<http://www.cdc.gov/niosh/pdfs/87-116-b.pdf>

Driving Standards Agency, History of the Highway Code

<http://www.dsa.gov.uk/Category.asp?cat=345>

Cummins, The History of Road Safety

<http://www.driveandstayalive.com/info%20section/history/history.htm>

[USW] United Steelworkers Training Guides to Industry, "Safety and Health in the American Steel Industry," <http://www.uswsafetyguide.org/3175.php>

Burgess, *Recognition of Health Hazards in Industry* (1995)

IIAHE, "Injuries, Illnesses, and Hazardous Exposures in the Mining Industry, 1986-1995: A Surveillance Report," <http://0-www.cdc.gov.mill1.sjlibrary.org/niosh/mining/pubs/pdfs/iaahe.pdf>

THE END

For more great books visit

<http://www.webscription.net>