History and Progress of Hunting Optics
where we started, where we are, where we are going

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November 20, 2014
Hunting Optics:

- Binoculars
- Rifle scopes
- Spotting scopes
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- Spotting scopes
Milestones in binoculars history

Galilean field glass (19th century)
Milestones in binoculars history

Binoculars with prismatic erector
(Ignatio Porro’s 1854 Italian patent)
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Milestones in binoculars history

Carl Zeiss (1816 – 1888)  Ernst Abbe (1840 – 1905)
Milestones in binoculars history

Binoculars with prismatic erector

Moritz Carl Hensoldt (1821-1903)
Milestones in binoculars history

Binoculars with prismatic erector

Moritz Carl Hensoldt (1821-1903)
Milestones in binoculars history

Binoculars with prismatic erector

Dr. Ernst Leitz II (1871-1956)
Milestones in binoculars history

Binoculars with prismatic erecter

Dr. Ernst Leitz II (1871-1956)
Contemporary binoculars

Porro Prism binoculars

Roof Prism binoculars
Contemporary binoculars

Inherently better design

Porro Prism binoculars

More popular

Roof Prism binoculars
Leica Ultravid 8X42

State of the art
Swarovski 8.5X42 EL

State of the art
How much better will binoculars get in the future?
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Example I: Leica 10X40 (1975) vs Leica 10X42 (2005)
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Light Transmission Measurements
Example II: Leica 10X50 Ultravid vs Leica 10X50 Ultravid HD
Example II: Leica 10X50 Ultravid vs Leica 10X50 Ultravid HD
Example III: Evolution of Zeiss 8X56 binoculars
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Binoculars Summary

- The performance summit was reached in late 90s.

- Misleading terms are being used to create a false sense of improvement (e.g. HD, high-transmission, flat-field, edge-to-edge sharpness, etc.)

- Binoculars are being optimized for bird watchers not hunters (e.g. adding near focus, variable-focus, etc.)

If you have a good pair of binoculars from late 90s or newer, keep it!
Hunting Optics:

- Binoculars
- Rifle scopes
- Spotting scopes
Early history of riflescopes

The use of a “telescope” as a sighting device on a rifle dates back to the US Civil War.
Early history of riflescopes

Early riflescopes had external adjustment for elevation and windage.
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Early riflescopes had external adjustment for elevation and windage.
Rifle scopes with internal adjustments appeared in early 20th century.

- adjustment was for elevation only
- mounting was very difficult
Early history of riflescopes

Later, riflescopes with both elevation and windage adjustments were also made.
Contemporary riflescopes

Since then, riflescopes have improved in both optical quality and mechanical precision.

However, their basic design has remained the same.

Zeiss 2.5-10X52, on the author’s Sauer 80 rifle (1976)
State of the art

Zeiss 3-12X 56 Victory HT
State of the art

Swarovski Z6 2-12X50
State of the art

Schmidt and Bender Stratos 2.5-13X56
State of the art

Today, all premium scopes have:

• 4X to 8X zoom range
• Internal adjustment
• 42mm to 56mm objective lens
• Illuminated reticle
• Waterproof and fog-proof housing
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But they also have fundamental design flaws!
Fundamental flaws of every rifle scope

1. Requires a precise eye position
2. Has parallax error
3. Mechanical adjustment is not robust
4. Optical path of the telescope is bent
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Schmidt and Bender Product Line (2014)

- Exos
- Stratos
- Zenith
- Summit
- Klassik
Schmidt and Bender Product Line (2014)

- Perfect scope: Klassik (introduced in 1990s)
- Cheap model: Summit
- Nothing new here: Zenith
- More zoom: Stratos
- Even more zoom!: Exos (introduced in 2014)
Reticles offered by Schmidt and Bender (2014)
Example I: Horus H37™ reticle
Example I: Horus H37™ reticle
Example I: Horus H37™ reticle

These reticles are marketed as “visual computers” and “ballistic calculation” tools while in truth they are nothing but visual distraction.
Example II: Zeiss Rapid-Z reticles
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- The Rapid-Z reticles are mounted in the 2nd Focal Plane of the riflescope!!

- The scales are valid only at highest magnification. At all other magnification, the reticle is just blocking your field of view and means nothing!!

It is a great way to convert your zoom scope into a fixed-power scope!
What is a good reticle then?

One of the great truths is that teenagers, newcomers and those seeking to impress all love complication. The more complex something is — whether it is a riflescope, the rifle itself or even something as basically uncomplicated as a sling — the better they like it. The thinking, presumably, is that sporting something complicated makes them look knowledgeable.

The Zeiss 64 reticle has been a European standard for decades and has a growing number of fans in the U.S. as well. It is a useful and stable hunting reticle.

The Zeiss 68 reticle is another European standard. It was probably the inspiration for the duplex reticle originated by Leupold and now the most common American design. Zeiss no longer offers a straight crosshair, presumably feeling the 64 and 68 do everything a crosshair does.
What is a good reticle then?

German #4 with illuminated dot
Riflescope Summary

• Riflescopes optical quality reached its peak in 1990s.

• Manufacturers are now competing over more zoom, more complicated reticles and other gimmicks.
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A new vision...
Bringing true innovation back to the hunting optics
Innovation I: Riflescope with optical adjustment system
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**Innovation I:** Riflescope with optical adjustment system

![Image of riflescope with labeling](image-url)

- **Fixed Prism**
- **Movable Prism**
- **Objective focal plane**
- **Precision Movement Control**
Innovation I: Riflescope with optical adjustment system

Advantages:

2. Robust and reliable adjustment: no tilting tubes, no pointy bearing surfaces, etc.
3. No turrets necessary!!
4. Many other advantages.
Innovation II: Riflescope with extended exit pupil
Innovation II: Riflescope with extended exit pupil
Innovation II: Riflescope with extended exit pupil
Innovation II: Riflescope with extended exit pupil
Innovation II: Riflescope with extended exit pupil

Video Clip:
Innovation III: Riflescope with ballistic zoom

Q: How do we compensate for bullet trajectory at longer range?
Innovation III: Riflescope with ballistic zoom

Q: How do we compensate for bullet trajectory at longer range?

A: We use the elevation turret or use the reticle to hold over.
Innovation III: Riflescope with ballistic zoom

Q: How do we compensate for bullet trajectory at longer range?

New Concept:
**Innovation III:** Riflescope with ballistic zoom

Q: How do we compensate for bullet trajectory at longer range?

New Concept:
Several other highly-innovative concepts are being patented.
Conclusions

- Hunting optics reached its performance peak in the late 1990s.

- Since then, manufacturers have been adding features that hunters do not need or cannot use.

- As hunters, we must be informed of the above facts and choose our optics wisely.
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• Hunting optics reached its performance peak in the late 1990s.

• Since then, manufacturers have been adding features that hunters do not need or cannot use.

• As hunters, we must be informed of the above facts and choose our optics wisely.

• The next generation of hunting optics is being born here in Los Angeles, California!