

# EYEPIECE EVOLUTION 1610 ~ 1990

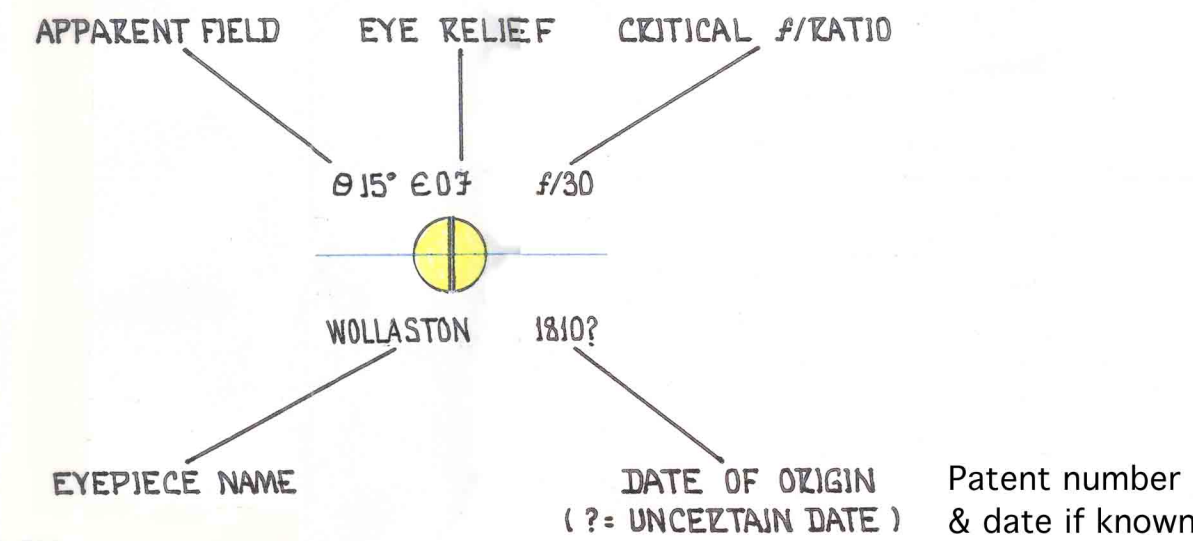
EYEPIECE EVOLUTION 1610 - 1995

EYEPIECES HAVE PROGRESSED A LONG WAY SINCE KEPLER SUGGESTED THE BI-CONVEX LENS IN 1610. THE TREE DIAGRAM SHOWS 88 DIFFERENT DESIGNS, FROM THE SIMPLEST SINGLE ELEMENT TO THE COMPLEX ACHROMATIC WIDE FIELD DESIGNS OF THE LATE C20th. THESE REPRESENT SUBSTANTIALLY THE GAMUT OF INVERTING EYEPIECES DEvised OVER FOUR CENTURIES.

THE TREE LINKS THE EVOLUTION IN DESIGN OF SIX PRINCIPAL TYPES: THE NEGATIVE; NEGATIVE - POSITIVE (ASYMMETRIC); SOLID; ORTHOSCOPIC (DISTORTION FREE); ACHROMATIC WIDE FIELD, AND COMPENSATING. THERE IS OVERLAP THAT BLURS THESE BASIC DISTINCTIONS. NEVERTHELESS THE CATEGORIES ARE VALID.

EACH EYEPIECE SCHEMATIC BEARS THE NAME AND DATE OF INTRODUCTION, (NOT NECESSARILY MANUFACTURE), THE APPARENT FIELD OF VIEW, THE EYE RELIEF IN TERMS OF EYEPIECE FOCAL LENGTH, AND THE CRITICAL FOCAL RATIO BELOW WHICH ABERRATIONS BECOME OBJECTIONABLE.

BY CONVENTION THE LENS SYSTEMS ARE DRAWN FACING LEFT, WITH THE EYEPOINT ON THE RIGHT.



## SINGLE LENS DERIVATIVES

## ACHROMATIC COMPOUND DERIVATIVES

010° E 0.33    f/35

KEPLER    1610

010° E 0.353    f/20

SIMPLE    1620

040° E 0.33    f/12

HUYGHENIAN    1703

015° E 0.7    f/30

HERSCHEL    1768

040° E 0.33    f/10

MITTENZWEY    1800?

045° E 0.33    f/10

AJRY    1835?

015° E 0.7    f/30

WOLLASTON    1810?

012° E 0.7    f/20

BREWSTER    1825?

015° E 0.7    f/20

CODDINGTON    1825?

015° E 0.7    f/20

STANHOPE    1825?

020° E 0.7    f/8

TOLLES    1855?

US Patent 13603

020° E 0.33    f/15

DOLLOND    1760

015° E 0.33    f/10

CHEVALIER    1830

020° E 0.33    f/15

STEINHEIL    1860?

025° E 0.33    f/8

STEINHEIL    1880

Monocentric

028° E 0.63    f/6

MONOCENTRIC    1830

020° E 0.33    f/10

ZEISS MONO.    1900?

030° E 0.33    f/6

HASTINGS    1910?

035° E 0.33    f/10

TRIPLER    1910

## ORTHOSCOPIC DERIVATIVES

030° E 0.33    f/6.5

ABBE ORTHOSCOPIC    1880

050° E 0.453    f/6

KONIG    1915

060° E 0.643    f/5?

050° E 0.323    f/5?

ORTHOSCOP II    1920?

## Orthoscopic

## Long Eye Relief

050° E 0.73    f/4

KLEE-PRETOKIA    1985

065° E 1.23    f/5

052° E 1.23    f/5

052° E 20mm    f/5

WIDE SCAN    1990 LE

1990 LV

1990

035° E 0.7    f/7

RAMSDEN    1783

030° E 0.253    f/17

MOD. RAMSDEN    1800?

030° E 0.43    f/16

ACHROMATIC RAMSDEN    1800?

US Patent 873870    1907

US Patent 873871    1907

050° E 0.323    f/6

KELLNER II    1907

053° E 0.663    f/4?

US Patent 1968222

ZEISS ASPHERIC    1934

050° E 0.463    f/4

ZEISS    1930?

060° E 0.723    f/5?

070° E 0.563    f/5?

EURYSCOPIC III    1940

ZEISS    1930?

STRAUBEL    1935?

067° E 0.693    f/5?

KONIG WIDEFIELD    1938

063° E 0.73    f/5

ZEISS ?    1942?

GOERZ    1924

055° E 0.463    f/5?

ZEISS ORTHOSCOPIC    1939

064° E 0.913    f/5?

075° E 0.33    f/4

GOERZ    1924

US Patent 1759529    1930

BAK & STROUD    1935

043° E 0.833    f/4.5

GALOC    1935

KALLISCOPIC    1941

060° E 1.23    f/4

GALOC HYBRID    1995

070° E 1.23    f/4

GALOC II    1995

060° E 0.33    f/5

PANSCOPIC    1995

## KELLNER DERIVATIVES

US Patent 1669682    1929

US Patent 1159233    1929

055° E 0.673    f/5?

055° E 0.33    f/5?

055° E 0.33    f/5?

US Patent 873871    1907

050° E 0.323    f/6

COOK E    1900?

065° E 0.693    f/5

BEKTELE    1925

KONIG    1915

055° E 0.923    f/5?

SCHULTZ    1925?

KONIG II    1938

US Patent 2206195    1940

US Patent 2206195    1940

063° E 0.73    f/5

ZEISS ?    1942?

## Achromatic Wide Field

040° E 0.33    f/6

TKIPLANE    1960

045° E 0.93    f/6

RKE    1975?

080° E 0.33    f/4

MOD. BEKTELE    1995

088° E 0.73    f/3.5

067° E 0.753    f/4

LEITZ WIDEFIELD    1990

SW ASPHERIC    1990

WIDE FIELD    1990

WIDE SCAN    1990

LE    1990

WIDE ORTHOSCOPIC    1990

## PLOSSL DERIVATIVES

045° E 0.773    f/6

SYMMETRICAL    1860

045° E 0.33    f/6

045° E 0.683    f/6

DIAL RIGHT    1860?

060° E 0.33    f/5?

055° E 0.53    f/5

ERFLE I    1917

070° E 0.63    f/5

ZEISS    1880

US Patent 1479229    1924

US Patent 1148704    1924

US Patent 2419151    1944

US Patent 2423676    1943

ERFLE II    1923

070° E 0.633    f/5?

055° E 0.323    f/5?

065° E 0.33    f/6

KAPELLA    1923?

ERFLE III    1923?

KASPEREIT    1923?

US Patent 2217281    1940

050° E 0.64    f/5

ZEISS    1939

050° E 0.33    f/5

BRANDON    1942

070° E 0.633    f/5?

055° E 0.323    f/5?

065° E 0.33    f/6

KAPELLA    1923?

ERFLE III    1923?

KASPEREIT    1923?

US Patent 2217281    1940

050° E 0.64    f/5

ZEISS    1939

050° E 0.33    f/5

BRANDON    1942

050° E 0.33    f/4?

ASTROPLANAR    1955

078° E 0.253    f/4

PLATYSCOPIC    1996

025° E 0.33    f/5

060° E 0.13    f/5

KALLIPLAN    1980

US Patent 4482217    1984

MOD. RAMSDEN    1980

## Negative

## Negative - Positive

050° E 1.133    f/4?

FLEISCHMAN    1977

US Patent 4054370

082° E 1.23    f/4.5

US Patent 4286844    1981

US Patent 4747675    1988

NAGLER I    1979

082° E 1.03    f/4.5

084° E 1.53    f/4

NAGLER II    1987

MEADE UWA    1985

## Compensating

043° E 1.03    f/10

SHOEMAKER    1975

040° E 1.03    f/16

TUSCON    1982

050° E 1.03    f/16

CLARKE    1982

## Solid

050° E 0.73    f/4

KLEE-PRETOKIA    1985