What is claimed is:

1. An imaging system for imaging an object within an extended depth-of-field (EDOF) at an imaging wavelength λ, comprising:

an optical system having an optical axis and consisting of a single lens element and an aperture stop arranged objectwise of the single lens element, the optical system having amount of spherical aberration SA wherein $0.2\lambda \leq SA \leq 2\lambda$ when forming an image of the object; and

an image sensor arranged to receive the image and form therefrom a digitized electronic raw image.

2. The imaging system of claim 1, further comprising;

an image processor electrically connected to the image sensor and adapted to receive digitally filter the digitized electronic raw image to form a digitized contrast-enhanced image.

3. The system of claim 1, wherein $0.5\lambda \leq SA \leq 1\lambda$.

4. The system of claim 1, wherein the aperture stop is located at an axial position that substantially minimizes comatic aberration.

5. The system of claim 4, wherein the single lens element is made of either glass or plastic.

6. The system of claim 1, wherein the single lens element includes at least one diffractive feature configured to reduce or eliminate chromatic aberration.

7. The system of claim 1, wherein the single lens element has first and second surfaces, and wherein at least one of the first and second surfaces is aspheric.

8. The system of claim 1, wherein the optical system has an F/# such that $F/1.4 \leq F/\# \leq F/15$.

9. The system of claim 1, further comprising:

a field lens arranged immediately adjacent the image sensor and configured to reduce an amount of field curvature imparted by the single lens element.

10. The system of claim 1, wherein the single lens element is selected from the group of lens elements comprising: a bi-convex lens element, a positive meniscus lens element arranged so as to have concave surfaces relative to the object, and a plano-convex lens element arranged to have an objectwise planar surface.

11. A method of forming an image of an object over an extended depth of field (EDOF) at an imaging wavelength λ, comprising:

forming a raw image of an object with an optical system consisting of a single lens element and an aperture stop arranged objectwise of the single lens element, wherein the optical system has an amount of spherical aberration SA such that $0.2\lambda \leq SA \leq 2\lambda$; and

using an image sensor, electronically capturing the raw image to form a digitized raw image.

12. The method of claim 11, wherein $0.5\lambda \leq SA \leq 1\lambda$.

13. The method of claim 11, further comprising:

digitally filtering the digitized raw image to form a contrast-enhanced image.

14. The method of claim 13, wherein the raw image has associated therewith a raw modulation transfer function (MTF), and further comprising:

establishing an amount of defocus in the digitized raw image based on a position of the object relative to the optical system;

forming an enhanced MTF from the raw MTF by multiplying the raw MTF by a gain function, wherein the enhanced MTF is a function of the amount of defocus; and

applying the enhanced MTF to the digitized raw image to obtain the contrast-enhanced image.

15. The method of claim 14, including:

measuring a distance between the object and the optical system; and

forming the enhanced MTF by applying a two-dimensional linear digital filter to the raw MTF according to the measured distance.

16. The method of claim 15, including measuring the raw MTF at different distances that overlap the depth of field DOF by using a slanted edge with uniform incoherent backlighting.

17. The method of claim 13, wherein the raw image has an associated raw MTF, and further comprising:

forming an enhanced MTF from the raw MTF by multiplying the raw MTF by a gain function, wherein the enhanced MTF is substantially constant as a function of focus position; and

applying the enhanced MTF to the digitized raw image to obtain the contrast-enhanced image of the object.

18. The method of claim 11, including arranging the aperture stop at an axial position that substantially minimizes comatic aberration.

19. The method of claim 11, including providing at least one diffraction feature on one or more surfaces of the single lens element so as to reduce chromatic aberration.

20. The method of claim 11, including providing at least one aspheric surface to the single lens element.

21. The method of claim 11, further comprising:

capturing N raw images of the object; and

averaging the N raw images to form a reduced-noise raw image.

22. An enhanced depth-of-field (EDOF) imaging system for forming a contrast-enhanced image of an object at an imaging wavelength λ, comprising:

an optical system consisting of a single lens element and an objectwise aperture stop, with the optical system having an amount of spherical aberration SA, wherein $0.5\lambda \leq SA \leq 2\lambda$, and wherein the optical system forms a raw image;

an image sensor arranged to receive the raw image and form a raw image electrical signal, wherein the raw image has an associated raw modulation transfer function (MTF); and

an image processor electrically connected to the image sensor and adapted to receive the raw image electrical signal and perform image-processing thereon to form the contrast- enhanced image using an enhanced MTF formed from the raw MTF using a rotationally symmetric gain function.

23. The EDOF imaging system of claim 22, wherein the image processor is adapted to average N contrast-enhanced images to form a final contrast-enhanced image having reduced noise as compared to any of the N contrast-enhanced images.

24. The EDOF system of claim 22,wherein the single optical element is selected from the group of lens elements comprising: a bi-convex lens, a positive meniscus lens arranged to have concave surfaces facing the object, and a plano-convex lens arranged to have an objectwise planar surface.

25. The EDOF imaging system of claim 22, wherein the aperture stop is arranged axially arranged at a position that substantially reduces or eliminates comatic aberration.

26. The EDOF imaging system of claim 22, wherein the single lens element includes at least one of a diffractive feature and an aspheric surface.

27. The EDOF imaging system of claim 26, wherein the at least one diffractive feature is integrally formed with the single lens.

28. The EDOF imaging system of claim 22, wherein the single lens element includes first and second aspheric surfaces.

29. A method of forming an image of an object over an extended depth of field (EDOF) at an imaging wavelength λ, comprising:

providing an optical system that consists of a single lens element and an aperture stop;

configuring the optical system to have an amount of spherical aberration SA such that $0.5\lambda \leq SA \leq 2\lambda$ so as to give rise to an objectwise zero-coma axial position relative to the lens element;

disposing the aperture stop substantially at the zero coma axial position so as to substantially eliminate comatic aberration in the image; and

electronically capturing the image to form a digitized raw image.

30. The method of claim 29, further comprising:

capturing N raw images of the object; and

averaging the N raw images to form a reduced-noise raw image.

31. The method of claim 29, further comprising:

digitally filtering the digitized raw image to form a contrast-enhanced image.

32. The method of claim 31, wherein the digitized raw image has a corresponding raw modulation transfer function (MTF), and further comprising:

forming an enhanced MTF from the raw MTF by multiplying the raw MTF by a gain function; and

applying the enhanced MTF to the digitized raw image to obtain the contrast-enhanced image of the object.

33. The method of claim 32, wherein the gain function is constant.

34. The method of claim 29, wherein the single lens element has a most imagewise surface from which the zero-coma axial position is located at distance D_{AS} therefrom, and wherein $1 \text{ mm} \leq D_{AS} \leq 20 \text{ mm}$.

What is claimed is:

1. An imaging system for imaging an object within an extended depth-of-field (EDOF) at an imaging wavelength λ and with an average modulation transfer function (MTF), comprising:

an optical system having an optical axis and consisting of a single lens element and an aperture stop arranged objectwise of the single lens element, the optical system having an amount of spherical aberration SA such that 0.2λ≦SA≦5λ when forming an image of the object, the single lens element being made of a glass or plastic material that generates an amount of axial chromatic aberration that increases the EDOF up to 20% while decreasing the average MTF of the optical system by no more than 25%, relative to the optical system having no chromatic aberration, the aperture stop being located at an axial position that substantially minimizes comatic aberration; and

an image sensor arranged to receive the raw image and form therefrom a digitized electronic raw image.

2. The system of claim 1, further comprising: an image processor electrically connected to the image sensor and adapted to receive the digitized electronic raw image digitally filtered to form a digitized contrast-enhanced image.

3. The system of claim 1, wherein 0.5λ≦SA≦1λ.

4. The system of claim 1, wherein the single lens element includes at least one diffractive feature configured to reduce chromatic aberration.

5. The system of claim 1, wherein the single lens element has first and second surfaces, at least one of the first and second surfaces is aspheric.

6. The system of claim 1, wherein the optical system has an F/# such that F/1.4≦F/#≦F/15.

7. The system of claim 1, further comprising: a field lens arranged immediately adjacent the image sensor and configured to reduce an amount of field curvature imparted by the single lens element.

8. The system of claim 1, wherein the single lens element is selected from the group of lens elements

comprising: a bi-convex lens element, a positive meniscus lens element arranged so as to have concave surfaces relative to the object, and a piano-convex lens element arranged to have an objectwise planar surface.

9. A method of forming an image of an object over an extended depth of field (EDOF) at an imaging wavelength λ, comprising:

forming a raw image of an object with an optical system consisting of a single lens element and an aperture stop arranged objectwise of the single lens element, the optical system having an amount of spherical aberration SA such that $0.2\lambda \leqq SA \leqq 5\lambda$;

wherein the single lens element is made of a glass or plastic material, and the glass material being selected to generate an amount of chromatic aberration that increases the EDOF by no more than 20% while decreasing the average MTF by no more than 25%, relative to the optical system having no chromatic aberration, the aperture stop being located at an axial position that substantially minimizes comatic aberration; and

using an image sensor, electronically capturing the raw image to form a digitized raw image.

10. The method of claim 9, wherein $0.5\lambda \leqq SA \leqq 1\lambda$.

11. The method of claim 9, further comprising: digitally filtering the digitized raw image to form a contrast-enhanced image.

12. The method of claim 11, wherein the raw image has associated therewith a raw modulation transfer function (MTF), and further comprising:

establishing an amount of defocus in the digitized raw image based on a position of the object relative to the optical system;

forming an enhanced MTF from the raw MTF by multiplying the raw MTF by a gain function, wherein the enhanced MTF is a function of the amount of defocus; and

applying the enhanced MTF to the digitized raw image to obtain the contrast-enhanced image.

13. The method of claim 12, including:

measuring a distance between the object and the optical system; and

forming the enhanced MTF by applying a two-dimensional linear digital filter to the raw MTF according to the measured distance.

14. The method of claim 13, including measuring the raw MTF at different distances that overlap the depth of field DOF by using a slanted edge with uniform incoherent backlighting.

15. The method of claim 11, wherein the raw image has an associated raw MTF, and further comprising:

forming an enhanced MTF from the raw MTF by multiplying the raw MTF by a gain function, wherein the enhanced MTF is substantially constant as a function of focus position; and

applying the enhanced MTF to the digitized raw image to obtain the contrast-enhanced image of the object.

16. The method of claim 9, including providing at least one diffraction feature on one or more surfaces of the single lens element so as to reduce chromatic aberration.

17. The method of claim 9, including providing at least one aspheric surface to the single lens element.

18. The system of claim 1, wherein the aperture stop is located relative to the single lens element at or near a zero-coma position.

19. The method of claim 9, wherein the aperture stop is located relative to the single lens element at or near a zero-coma position.