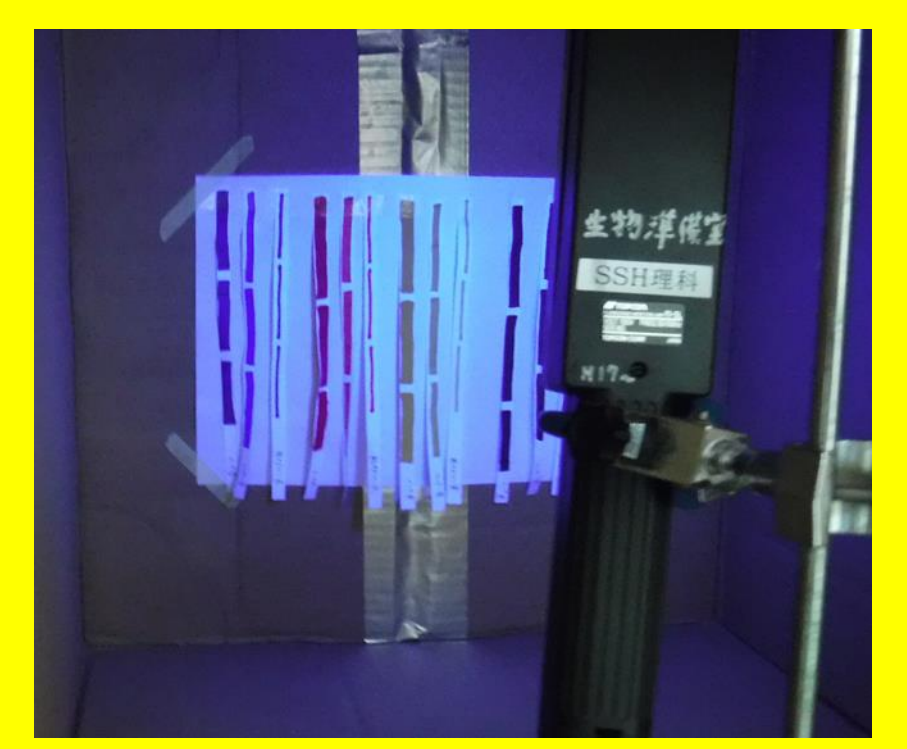


# Ink improvement

~ Make ink that does not fade easily ~



## <Summary>

We investigated whether the ink drawn on the paper faded due to sunlight. Brightness and saturation were measured using "Image J" to determine the degree of change.

## <Purpose>

The problems in construction work is if the ink fades, the warning sign becomes unreadable, an accident occurs, or the letter you want to cherish forever disappears. These problems can be solved by preventing the ink from fading, so I want to make an ink that does not fade easily.

## « Definition of fading »

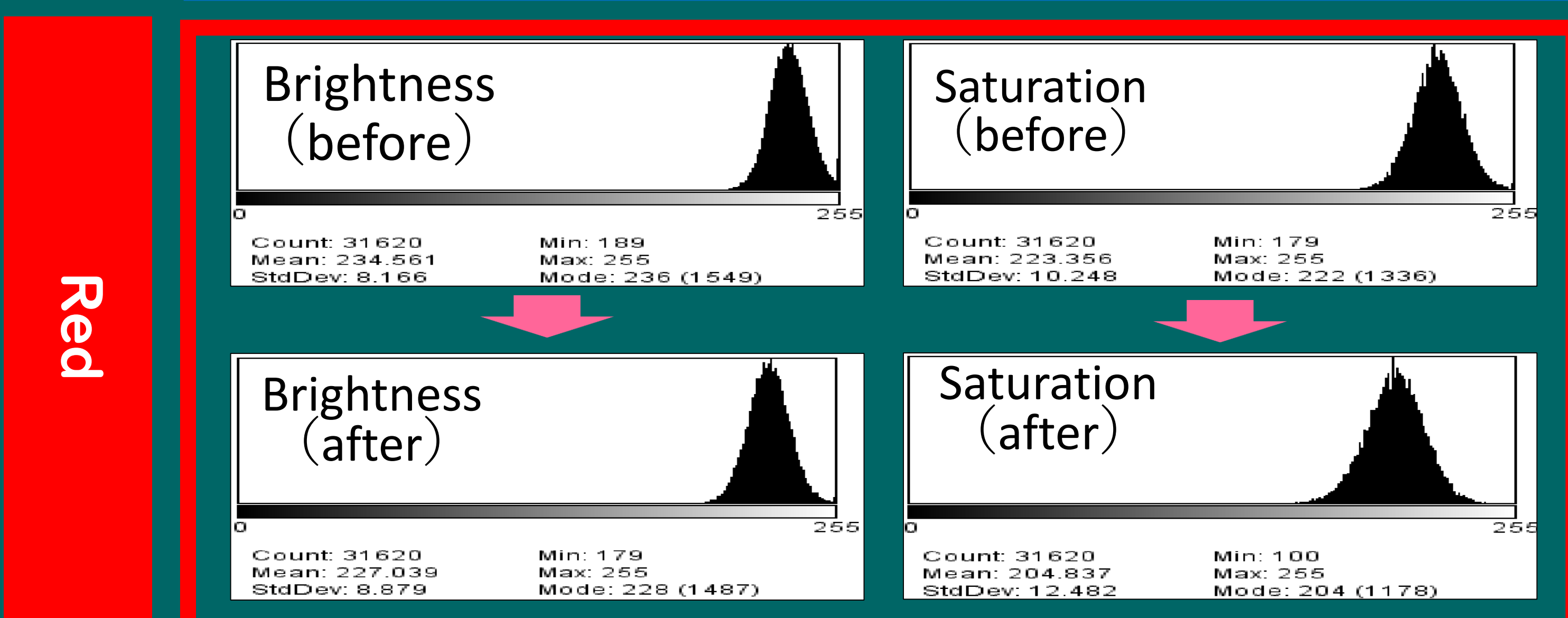
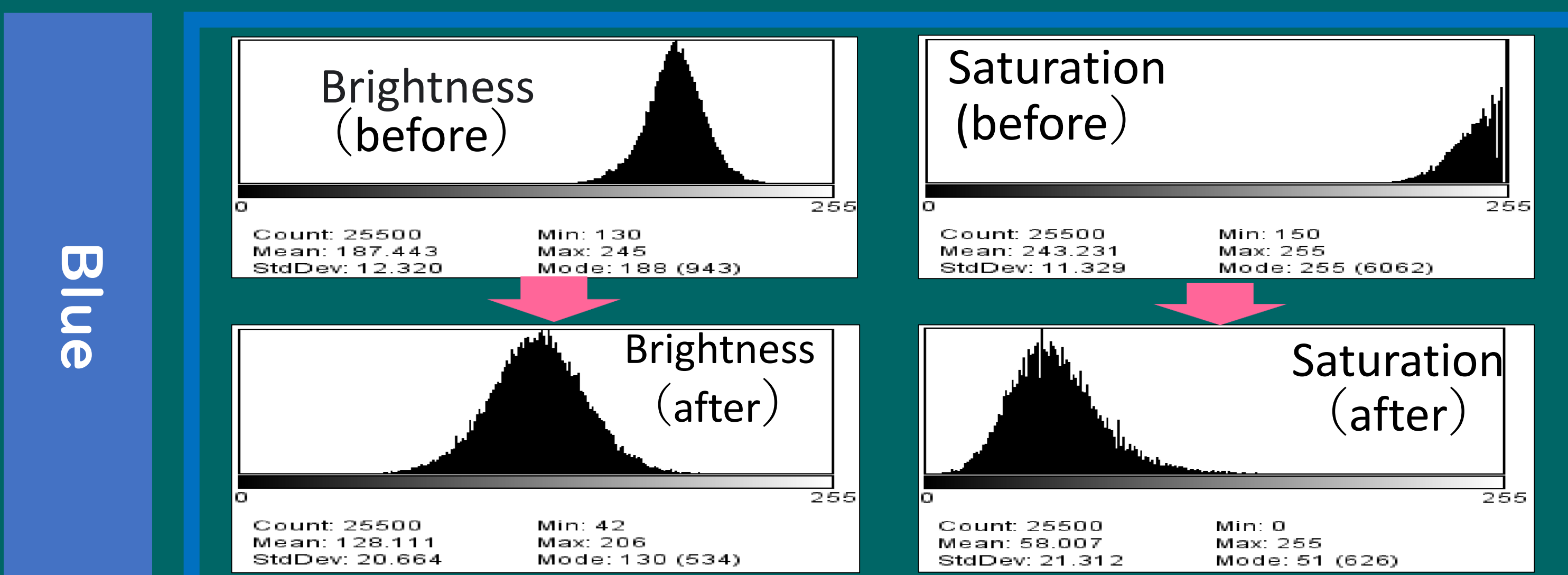
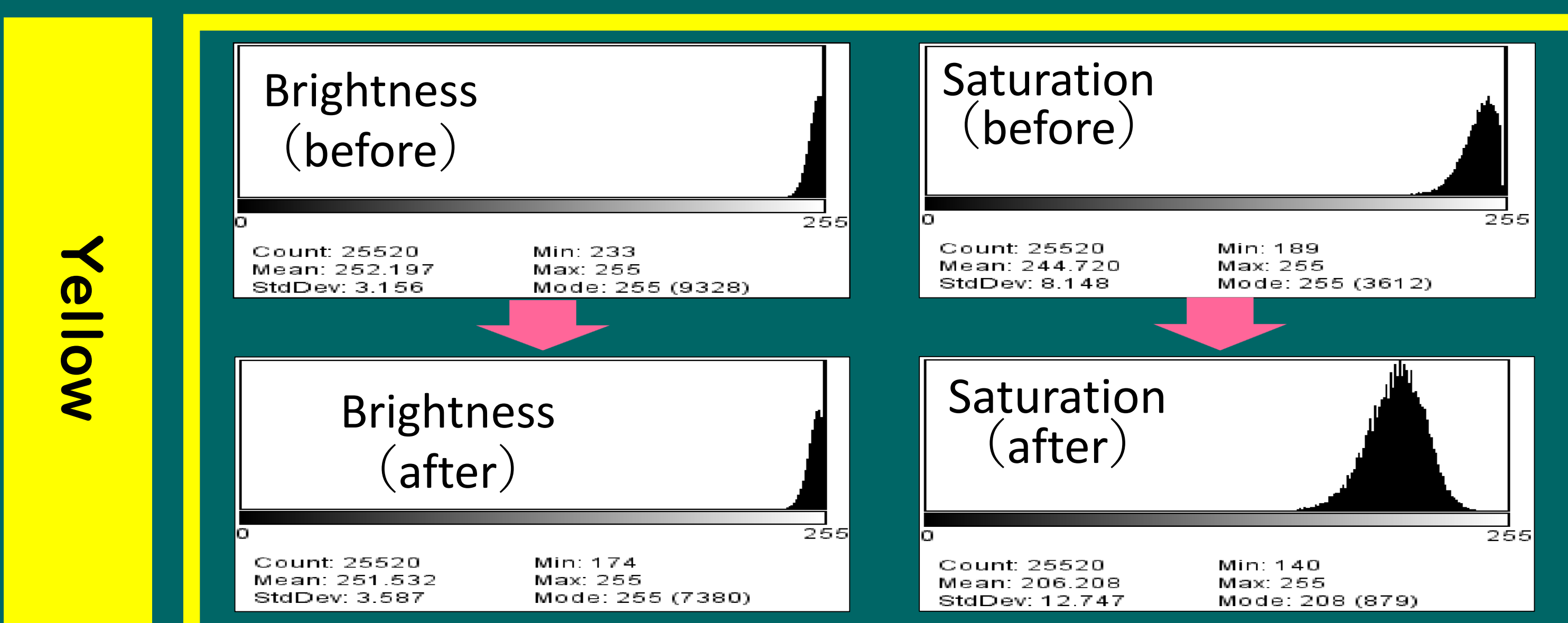
Desaturation. Or, the brightness should increase.

## <Hypothesis ①>

The way it fades is different for each color.

## <Experiment ①>

Place the paper lined with an oil-based pen in the sun for two weeks. Capture the image using a scanner. Compare the measurement results using "ImageJ" for the degree of change.



## <Result ①>

The average and mode values of lightness and saturation of all colors decreased. Blue had the biggest change.

## <Consideration ①>

The higher the brightness of the color, the less likely it is to fade.

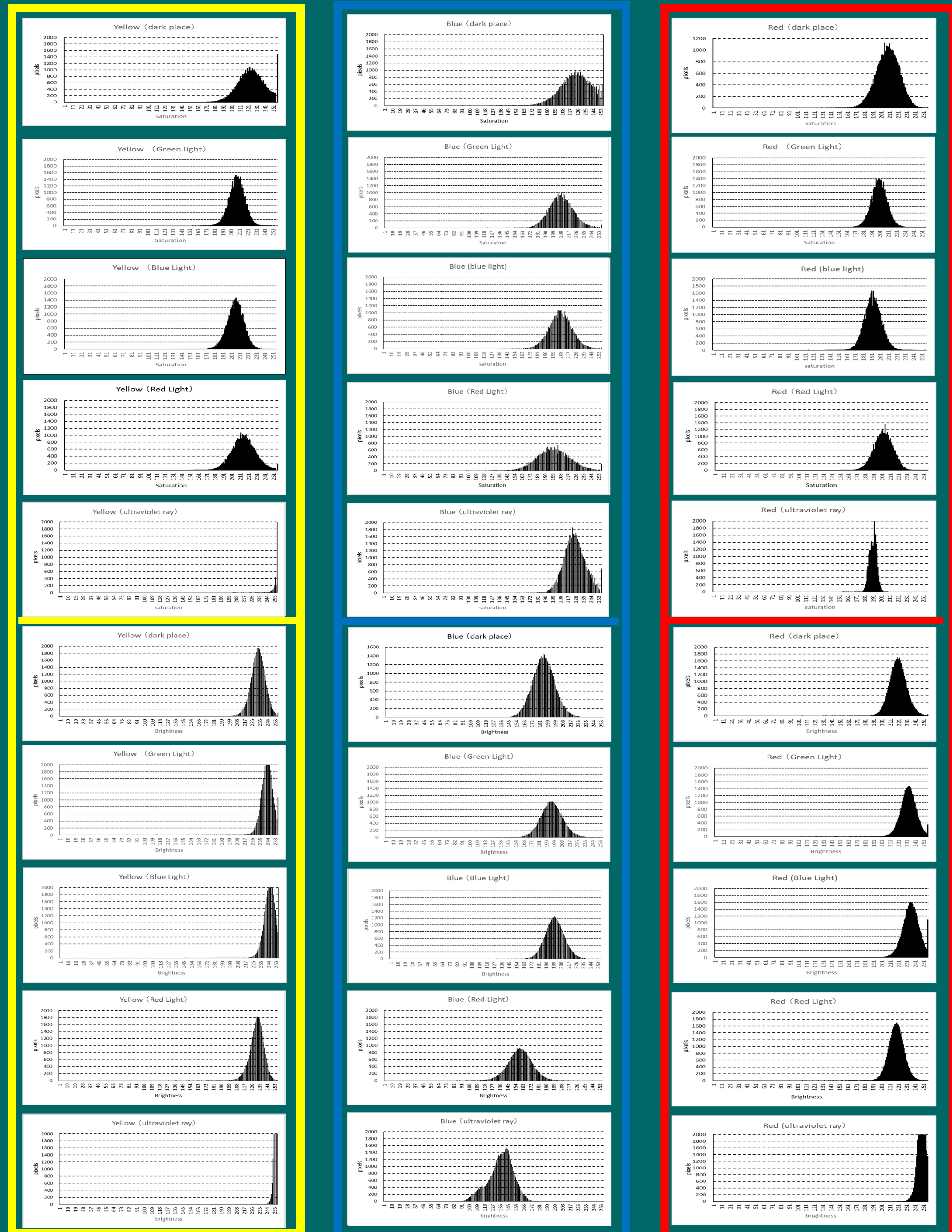
Blue is considered to be the easiest to fade.

## <Hypothesis ②>

The way it fades is different for each wavelengths of light.

## <Experiment ②>

Place the paper lined with an oil-based pen ultraviolet ray and three colors light for a week.



## <Result ②>

When exposed to three colors of light, the saturation decreased and the brightness increased.

When exposed to ultraviolet rays, the saturation of blue has decreased. Red saturation has decreased, brightness increased.

## <Consideration ②>

It is considered to be the cause of fading of ultraviolet rays. It is thought that there are other than light causes of fading.

## <Summarize>

- The main cause of fading is light because it faded when exposed to light. It turned out that there was.
- There is a big difference in the amount of change in brightness and saturation between water-based pens and oil-based pens. So the water-based pen and the oil-based pen didn't fade in the same way.

## <Prospect>

- Investigate the detailed components of the ink to make the ink that does not fade.
- Investigate how the color changes due to changes in temperature and humidity.
- Investigate the mechanism that changes with sunlight.

## <References>

Rasband, W.S., imageJ, U.S. National Institutes of Health, Bethesda, Maryland, USA, <http://image.nih.gov/ij/1997-2021> (Browsing2020.11.17)

[http://www.nipponpaint.co.jp/biz1/building/faq\\_606.html](http://www.nipponpaint.co.jp/biz1/building/faq_606.html) (Browsing2020.11.19)