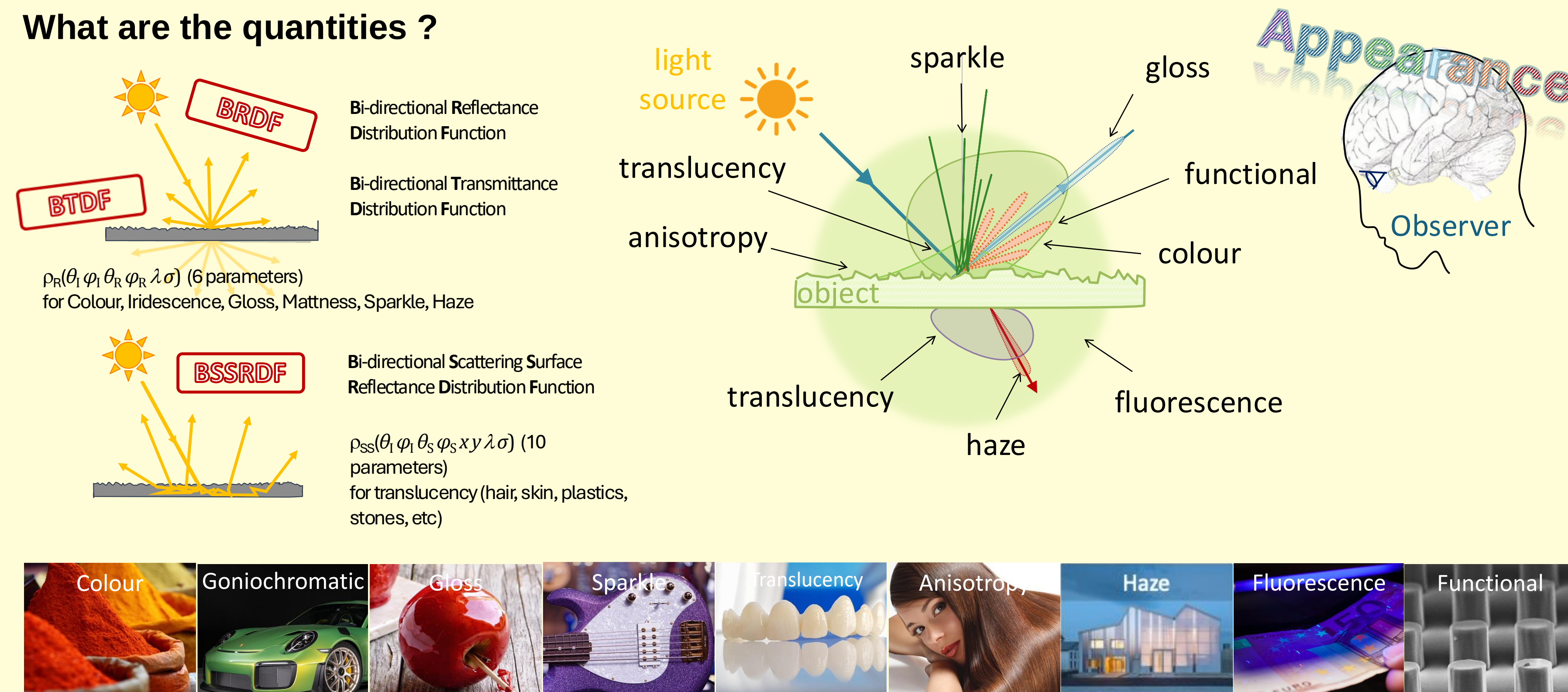


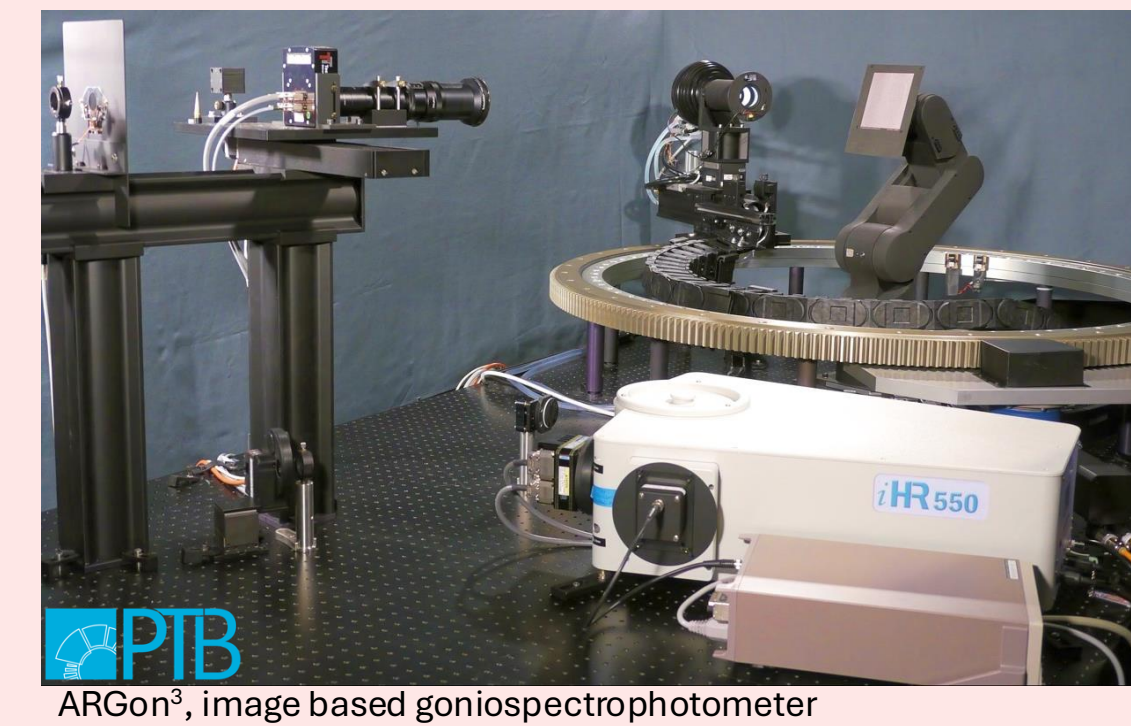
Topic

After the success of colorimetry, which enabled the control of the colored appearance of manufactured objects, today, metrologists must provide measurement protocols, instruments, and a traceability chain to the SI that allow quantifying other visual attributes, such as gloss, matte, translucency, haze, and sparkle. These solutions will help improving the quality of real and virtual objects.

What are the quantities ?



Work in progress



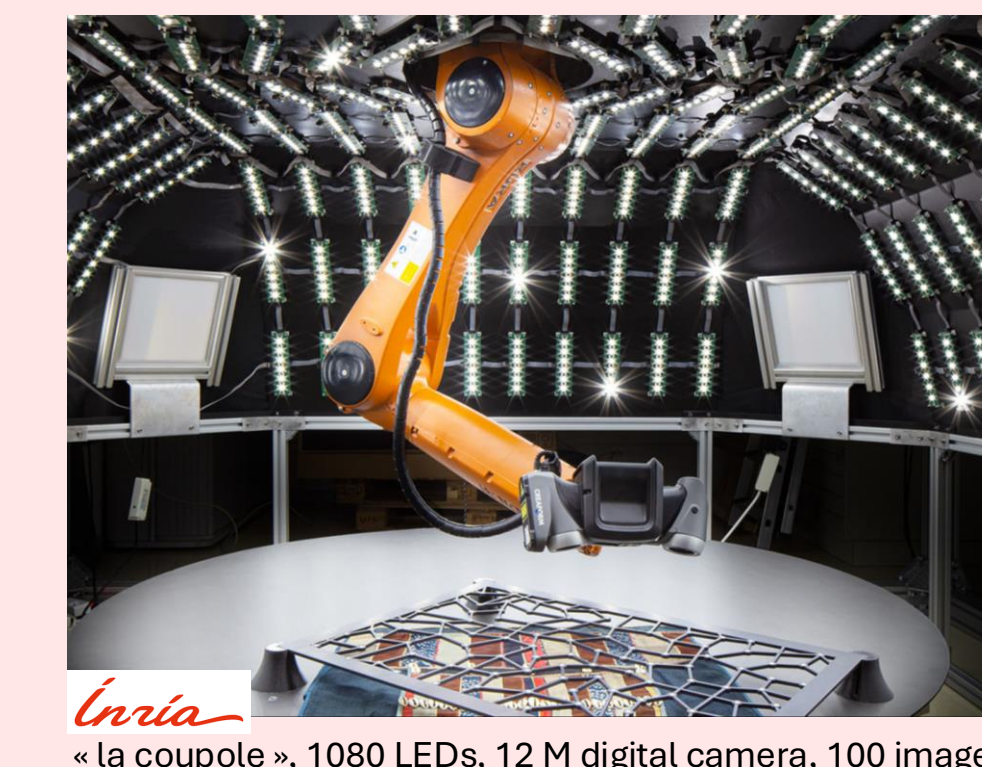
Development of traceable goniospectrophotometers for measuring the bidirectional optical properties of surfaces showing sophisticated visual effects,

Engagement with industrials in order to simplify measurement conditions of complex scattering quantities (BRDF, BTDF, BSSRDF) realized at NMI level, to reach an effective metrology of these quantities adapted to the industrial constraints (i.e. fast, simple, efficient & traceable),



Development of measurements of perception models of gloss, translucency, mattness, haze, and the next generation of visual effects,

Definition of tools dedicated to the digitalization of the appearance of materials including thresholding, sampling strategy, compression and interpolation models, in order to support industry, whose activity is based on reproduction of appearance (3D printing, virtual reality, cultural heritage, metaverse),



Exploration of unsolved metrological issues in the field of bidirectional spectrophotometry that are limiting the knowledge and the uncertainties on spectrophotometric quantities i.e. measurement of haze, transmittance of thick samples, multiscale traceability, specular gloss index.

Impact



Better quality control of production

Less rejection, less waste, better competitiveness

3D printing and reproduction of appearance

Dissemination of cultural heritage and education



Virtual prototyping

Reduction of waste and of production of physical objects

Progress in functional surfaces

Energy saving in buildings and greenhouses

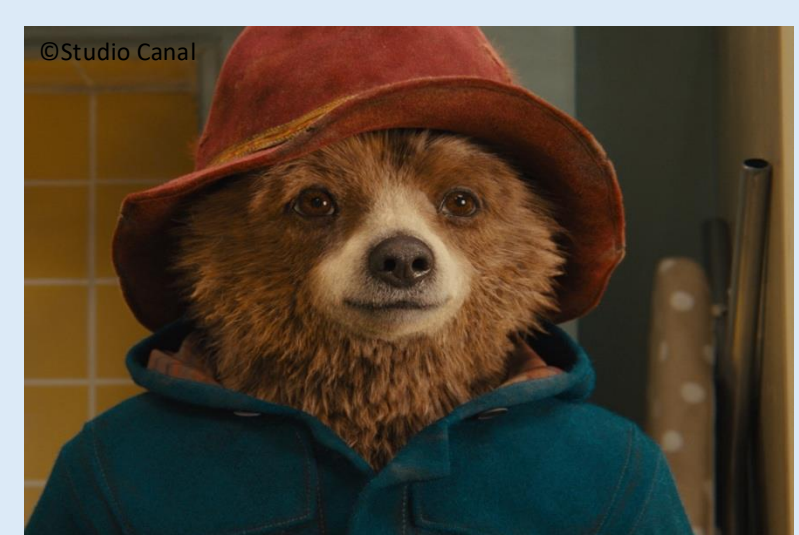


Better comprehension of skins properties

Nose, teeth and ear prothesis

Rendering in Virtual reality

Movies and videogames



Digital twins & metaverse

Future developments

Methodology

In the metrology of appearance, the measurand cannot be directly accessed by the instrument because it resides in observers' head. The methodology involves performing both spectrophotometric and psychophysical (perceptual) measurements on the same set of artifacts to obtain a perception model.

Initially specific to each individual, this model can be standardized, leading to the creation of a standard observer (e.g., the CIE 1931 Standard Colorimetric Observer). This standardization makes it possible to define a perceptual quantity and establish a measurement chain traceable to the SI.

