

# Final Patent Selection

## Patent Review (3)

US 10,620,460 B2 - Hands-free Spectrally Tunable Smart Loupe

<https://patentimages.storage.googleapis.com/f4/a0/0d/d9c8f843521cad/US10620460.pdf>

Date of Patent: Apr 14, 2020

Inventor: Christopher R. Carabin

Assignee: Rancho El Toston, LLC

### Problem/Motivation:

- Lighting in existing loupes is fixed/manually controlled
  - Stages of procedures can require different lighting (curing resins, color matching)
- Manual adjustment of touching loupe interferes with surgical field
- Direction of light vs optical axis of magnifier can misalign/require re-adjustment if mount is bumped
- Many devices put weight on nose/small contact points that cause discomfort
- Open battery compartments or openings can harbor pathogens

### Core Invention/Claims

1. Frame/Mounting
  - a. Frame that holds lenses and supports lighting module
  - b. Frame that presses against wearer's head to better distribute weight
2. Spectrally Tunable Lighting Module
  - a. 1+ LED with varying spectral characteristics (wavelengths/intensities/color temperature)
  - b. Adjustable lighting module with degrees of freedom to align with light with magnifier's optical axis
  - c. Lighting with different colors to achieve tunability (RGBW, cool white/warm white etc)
3. Control Module + Hands-Free Interface
  - a. Control module that takes lighting commands and drives the LED module accordingly
  - b. Hands free interface that allows user to control lighting without manually adjusting components (voice commands, gestures, other transducers)

- c. Optional communications interface to receive lighting commands remotely/integrate with external systems
- 4. Power/Battery Module
  - a. Battery embedded within frame
  - b. Charging circuitry to recharge without needing open covers that compromise hygiene
  - c. Frame and module layout to minimize openings or seams

US 12,044,858 B2

<https://patentimages.storage.googleapis.com/ca/8a/3b/8387f8b466b0b8/US12044858.pdf>

Date: July 23, 2024

Inventor: Tomer Gera

Assignee: Augmedics LTD

**Problem/Motivation**

- In surgical resection (specifically tumor resection), beneficial to visualize fluorescent dyes in real time .
- Standard surgical loupes do not provide fluorescence imaging
- Existing fluorescence imaging devices are often bulky, microscope based, or not integrated with wearable loupes.

**Core Invention/Claims**

- Wearable loupe with dual illumination and imaging (one for regular illumination, one for fluorescence excitation. Camera captures same optical path as the user, surgeon sees what camera sees.
- Real time visualization of tissue fluorescence (tumor margin identification/resection guidance)
- Compact integration

US 9,729,831 B2 - Wireless Surgical Loupes

<https://patentimages.storage.googleapis.com/05/df/3d/59789c30f683bb/US9729831.pdf>

Date of Patent: August 8, 2017

Assignee/Inventor: Sony

**Problem/Motivation**

- Surgeons use optical loupes during delicate surgeries, providing magnification but lacking ability to integrate digital information (video capture, remote viewing, overlays)

- Need to augment loupes with digital capabilities - capture through the lens view, transmit it, and overlay/display relevant patient data
- Combining optical magnification with digital/wireless interactivity could enhance surgical workflows, education, documentation etc.

#### Core Invention/Claims

- Lens + Half mirror/beam splitting optical path
  - Light from lens gets split between surgeons eye and camera
- Wireless transmission and data flow
  - device can display patient information on mini-display in the loupe
- Through-the-lens display + overlays
  - System capable of overlaying patient or monitoring information in user's optical path via projection through or reflection off the half mirror
- 3D Stereo imaging
  - Optional embodiment: 2 separate lenses/images can be captured to allow stereoscopic or 3D imaging

## Comparison

#### Relative Merits and Demerits VS Existing Patents

US 10,620,460 B2:

Merit:

- Our concept extends beyond illumination into streaming, collaboration, data capture, and AI driven workflows. This patent is essentially a lighting solution, ours is a multi-function visualization/communication platform.

Demerit:

- General form factor (loupe with integrated electronics) is similar, so need to emphasize functionality beyond lighting.

US 12,044,858 B2

Merit:

- System is task specific (fluorescence-guided surgery), ours in workflow-agnostic.
- We also emphasize sharing the live view with others, not just enhancing surgeon's perception

Demerit:

- Both rely on integrating digital imaging into the loupe. Creates risk that system could be interpreted as a generalized version of what this patents already does, rather than a novel

invention.

- Since both are head mounted loupes with imaging sensors, the hardware integration concept is similar

US 9,729,831 B2

Merit:

- Focus is on capturing/streaming what surgeon sees and optionally overlaying vitals
- Ours focuses on collaborative use + education + AI dataset generation, not just remote viewing
- We integrate sterile usability, simple activation, compatibility with surgical workflow

Demerit:

- This prior art covers beam splitter optics, camera integration, wireless transmission, and overlays. On the surface, our device would be seen as another wireless streaming loupe.
- The granted claims are relatively broad around wireless transmission of the surgeon's view which narrows our space.
- Hints at remote viewing for training/teaching. We need to draw a sharper line to show novelty in structured data capture/workflow integration rather than just recording.

## **Patentability Assessment**

**Novelty**

- None of these patents describe a surgical loupe as an integrated collaboration + education + AI platform
- Prior art focuses on illumination, specialized fluorescence, or wireless streaming
- The combination of ergonomic design, general-purpose streaming, and AI-oriented data capture in a single sterilizable loupe is not disclosed on these patents

**Utility**

- Design addresses well-documented clinical problems
  - Surgeon musculoskeletal strain (ergonomics)
  - Need for teaching tools (streaming)
  - Modern AI-driven medicine (structured data capture)
- Device clearly useful in surgery, education, and research

**Non-Obviousness (Ingenuity)**

- Though each piece exists separately, it's not obvious to combine them because:

- Prior art does not suggest that surgical loupes should double as educational broadcast tools or AI dataset generators
- Integrating ergonomics, optics, streaming, and sterilization in one wearable requires non-trivial engineering trade-offs (heat, weight, optics, networking)

#### **Overall**

Our design appears patentable if our claims are framed around:

1. Integration of functions (ergonomics, streaming, AI/data capture, workflow compliance)
2. New use cases (collaboration, education, AI training)
3. Non-Obvious System Architecture (sterile, wearable, ergonomic, multipurpose device)