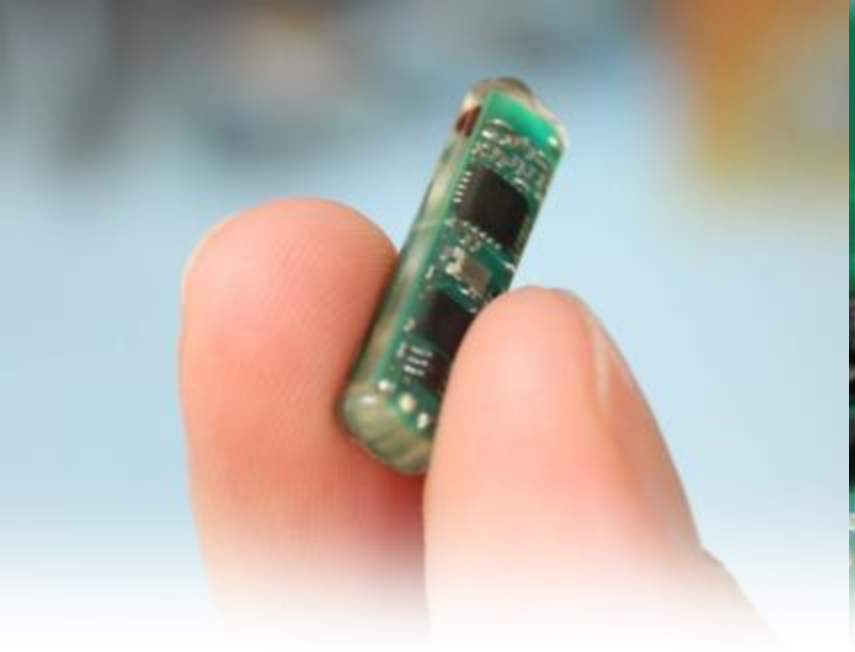


Innovation in wireless in-body devices

- the power of wireless -

ovesco
innovation in scope

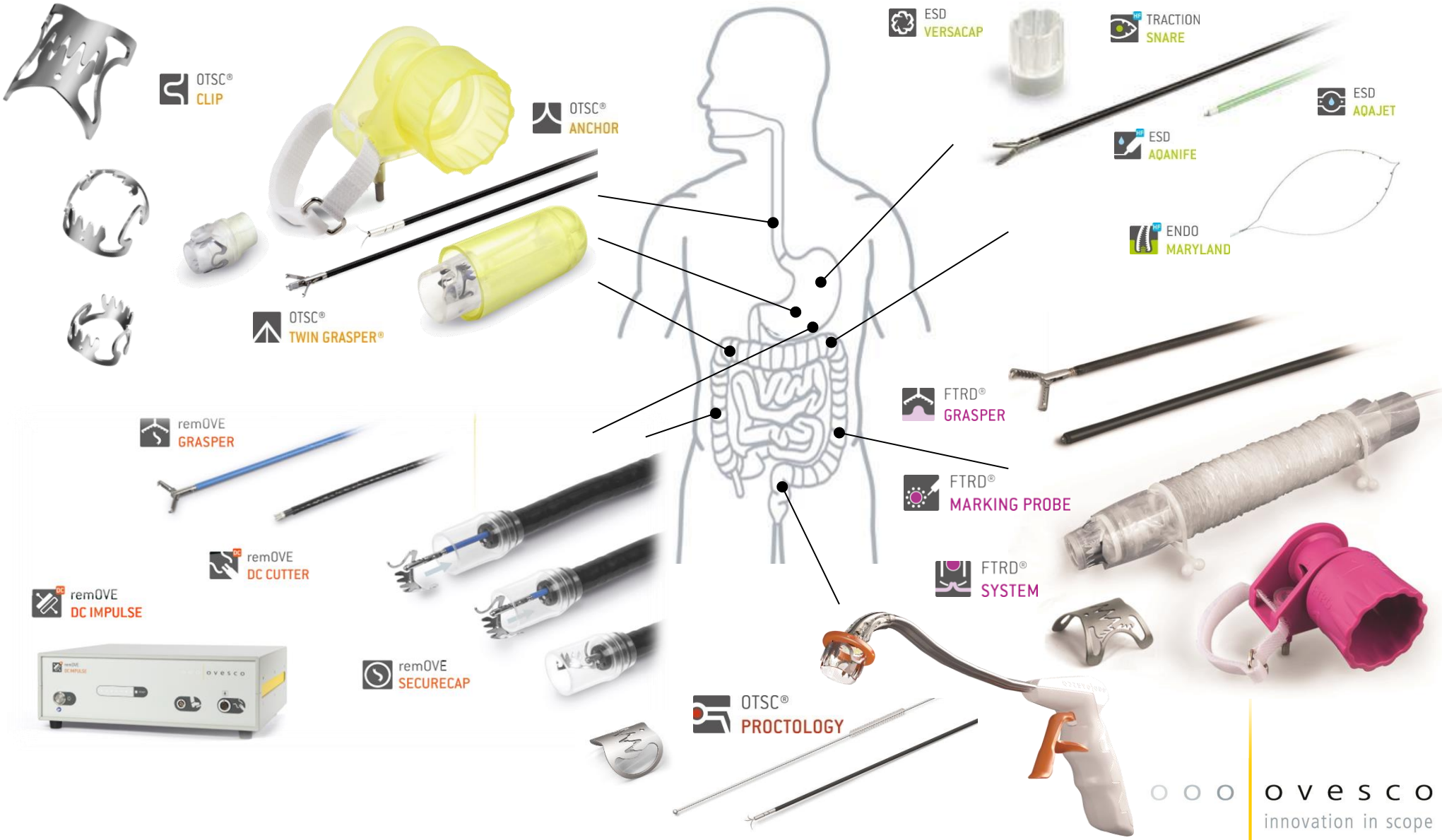
IRACON

3rd MC meeting and
3rd technical meeting

Dr. Sebastian Schostek

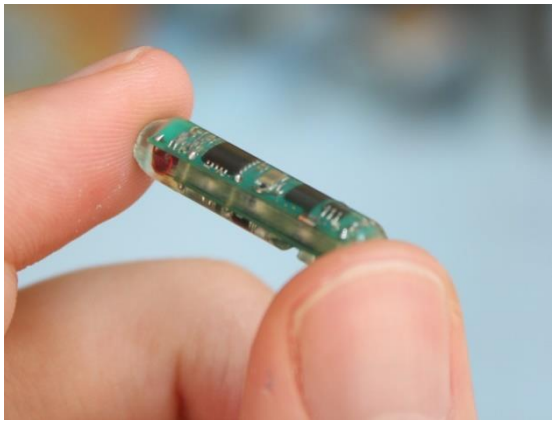
Vice President
Division Diagnostic Systems
Ovesco Endoscopy AG
Tübingen, Germany

Product portfolio: interventional endoscopy



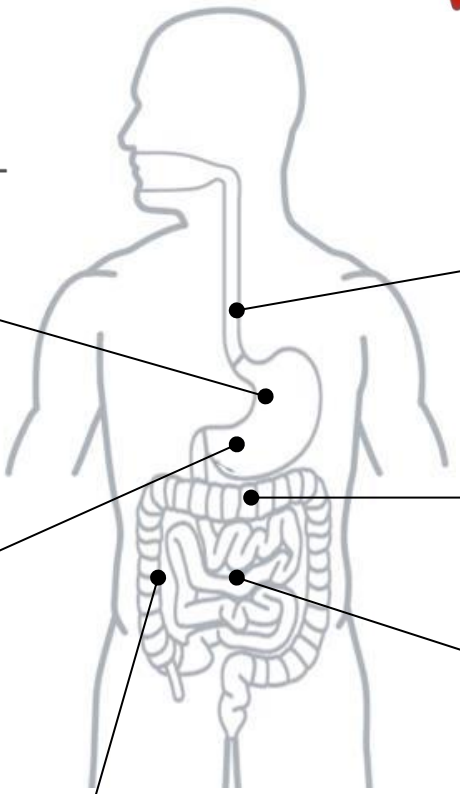
R&D pipeline: diagnostic systems

WIBEC Wireless In-Body Environment



HEMOPILL ACUTE

HEMOPILL IMPLANT



HEMOPILL RECEIVER

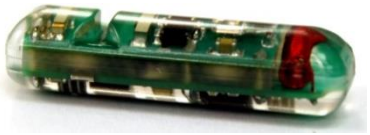
pow VECTOR

Strong history in European R&D projects

BIOLOCH

netMED

VECTOR
WIRELESS ENDOSCOPY



A.R.A.K.N.E.S.
Array of Robots Augmenting the KINematics of Endoluminal Surgery

WBEC Wireless In-Body Environment

Endovespa
Endoscopic Versatile robotic guidancE, diagnoSis and theraPy of magnetic-driven soft-tethered endoluminAl robots

FP4

FP5

FP6

FP7

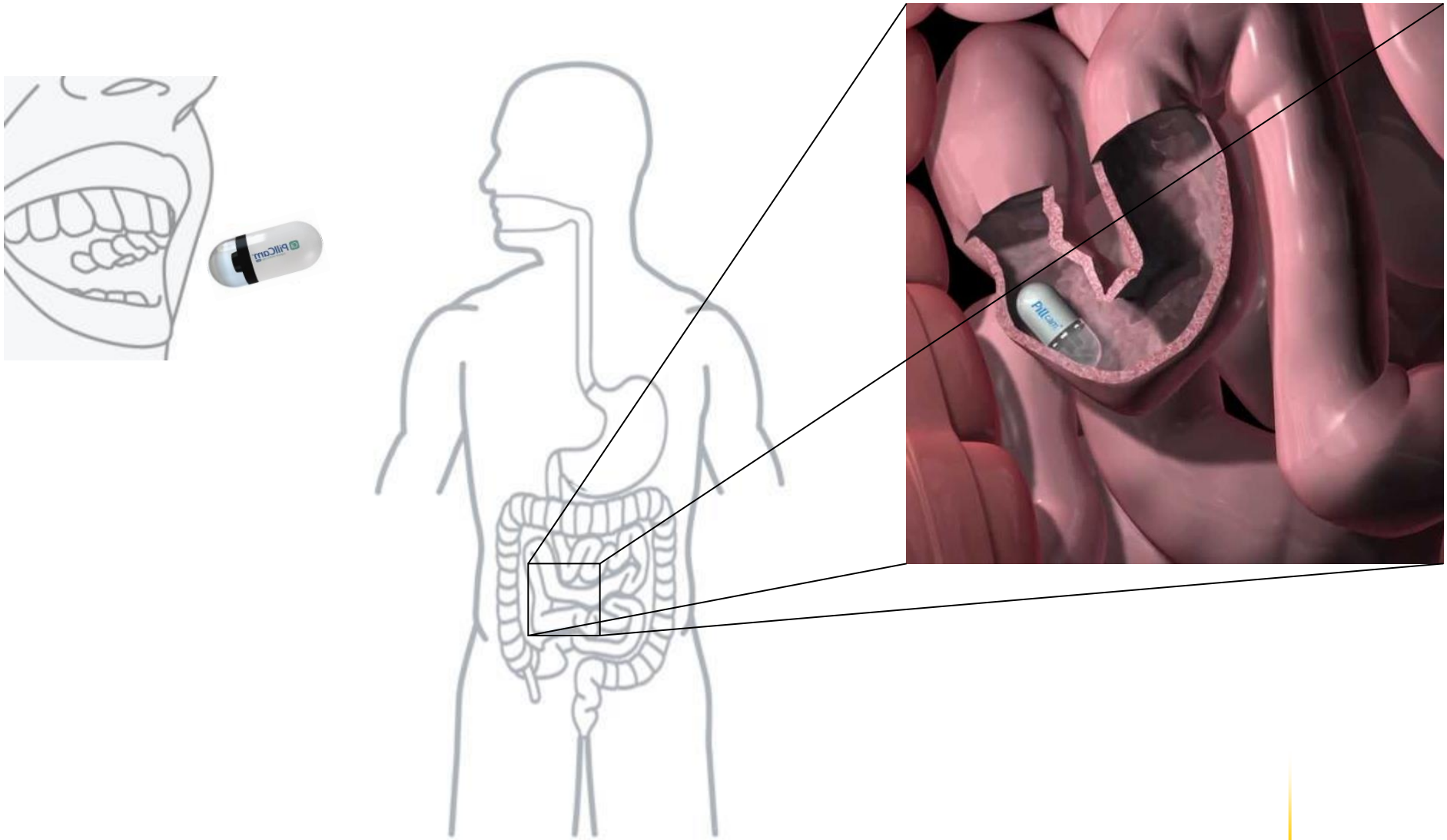
H2020

2001: Market launch of the M2A (mouth to anus) capsule endoscope, Given imaging, Israel

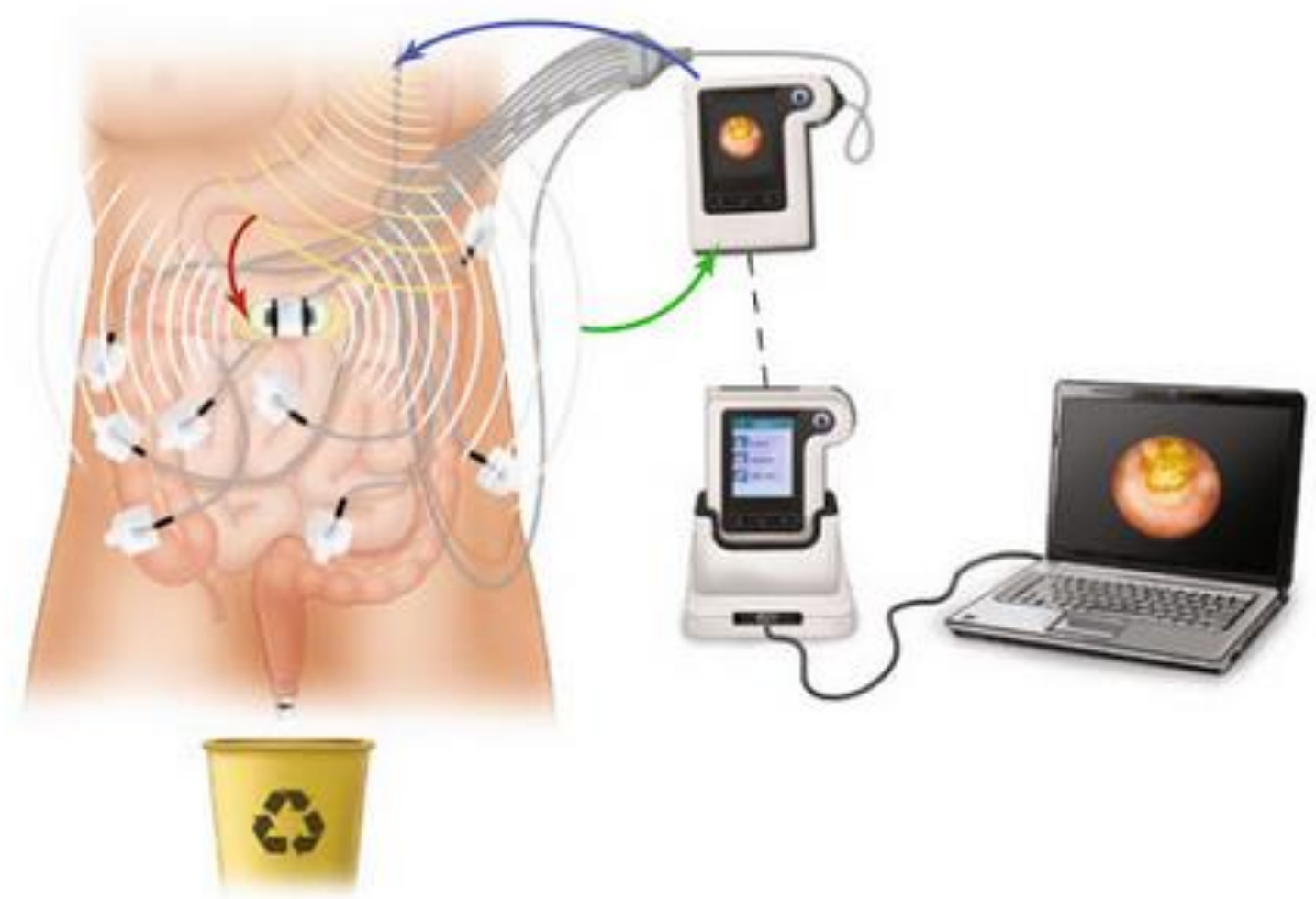
INSIDE THE M2A™ CAPSULE

1. Optical dome
2. Lens holder
3. Lens
4. Illuminating LEDs (Light Emitting Diode)
5. CMOS (Complementary Metal Oxide Semiconductor) imager
6. Battery
7. ASIC (Application Specific Integrated Circuit) transmitter
8. Antenna

M2A (later: ‚Pillcam') led to a paradigm shift in GI diagnosis

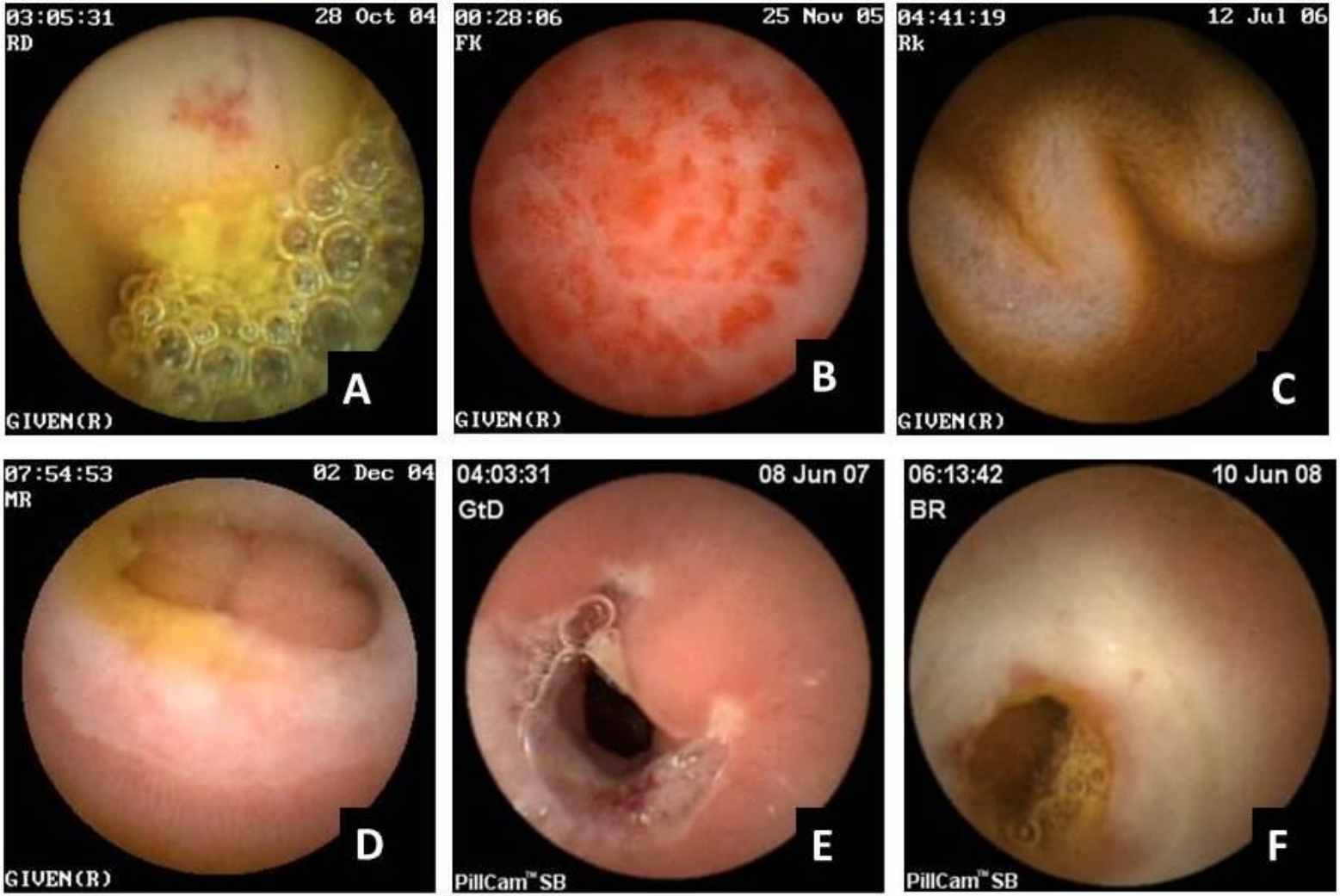


M2A (later: ‚Pillcam') led to a paradigm shift in GI diagnosis

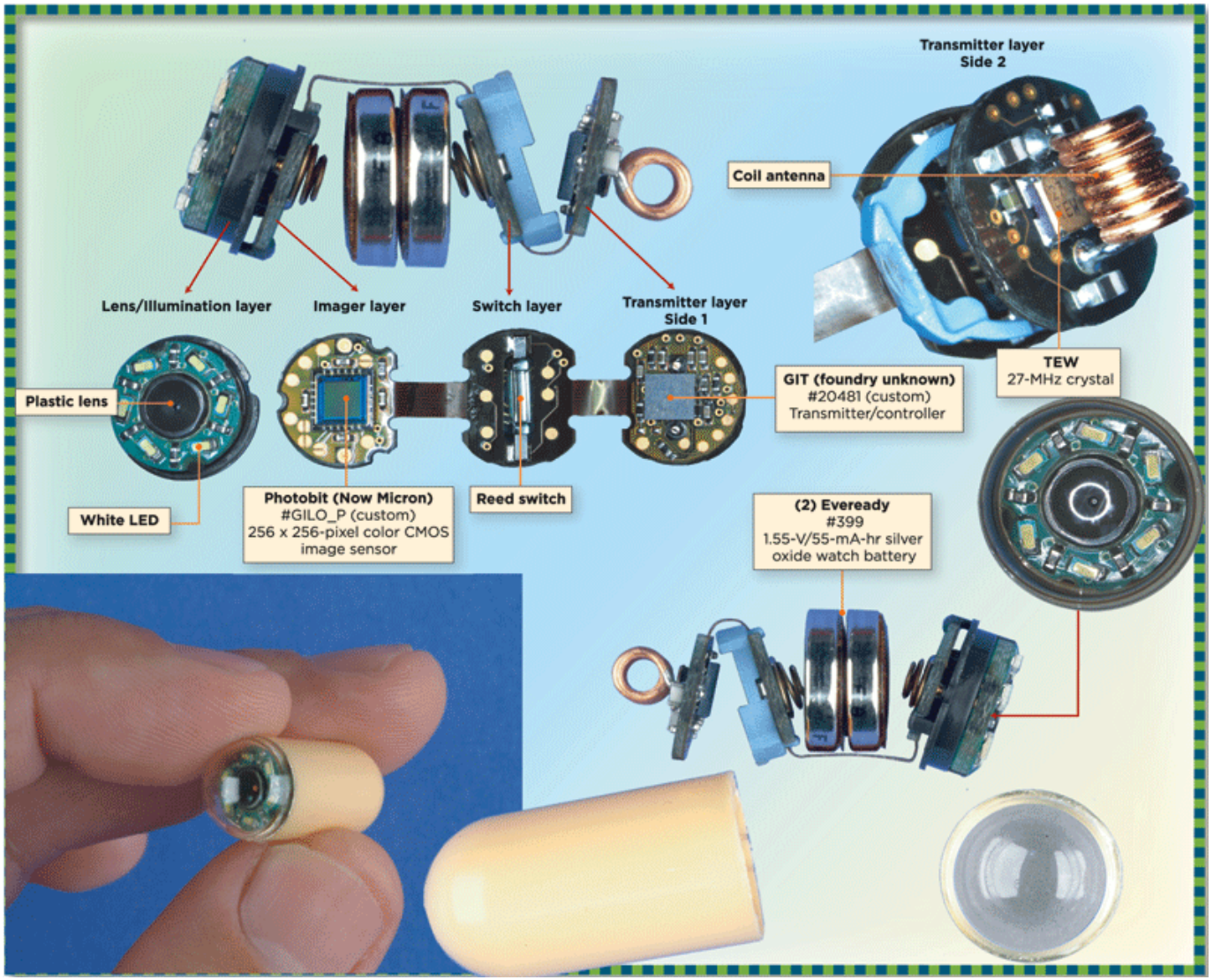


Hagenmüller et al, 2014

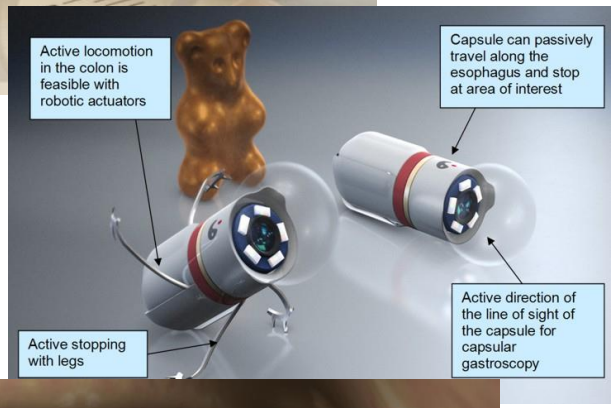
Pillcam: Pioneering the field of small bowel diagnosis

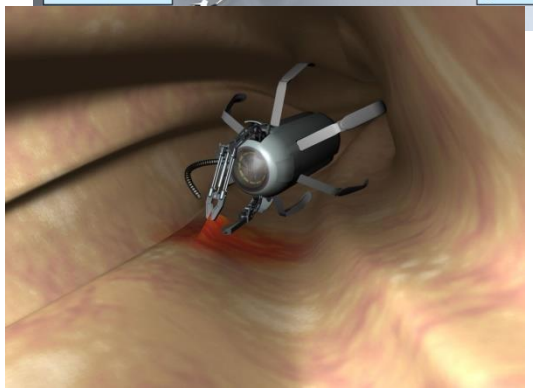


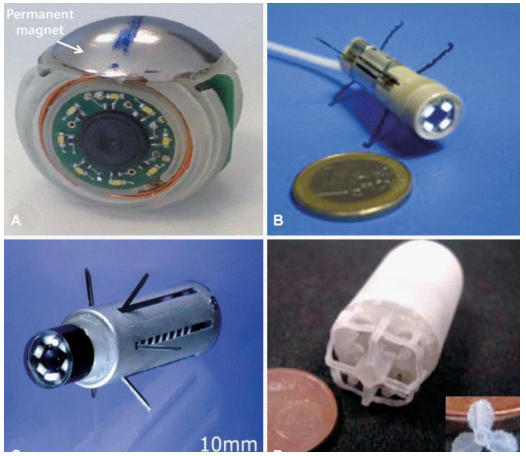
Pillcam, an integrated battery powered system

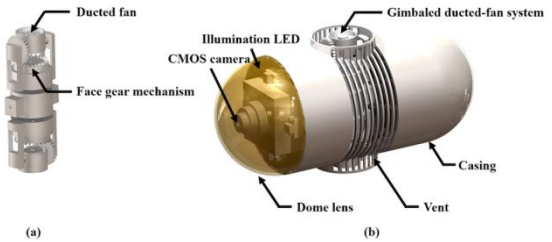


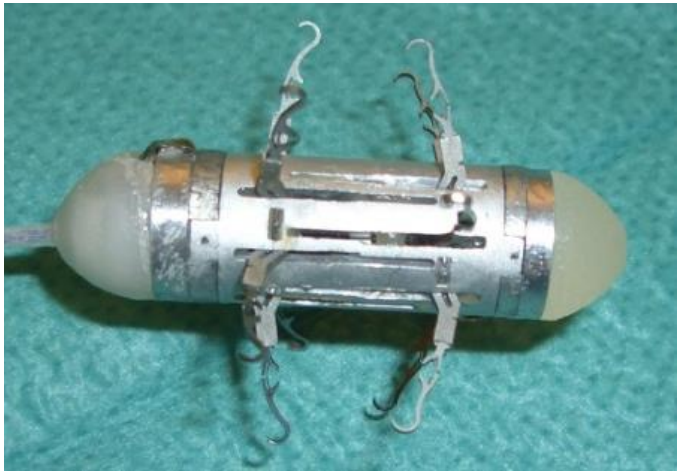
The race began – research gone wild

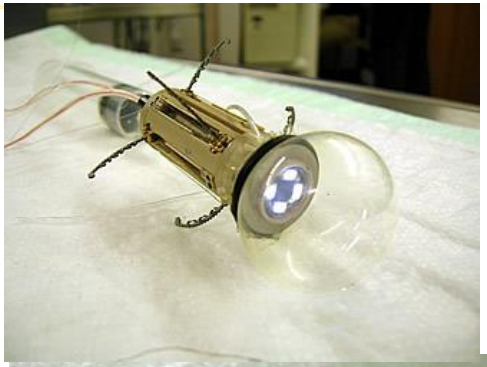


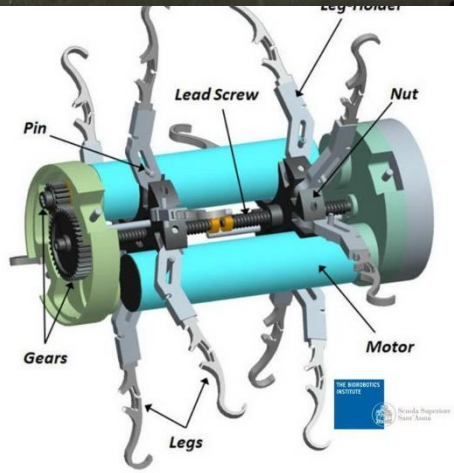






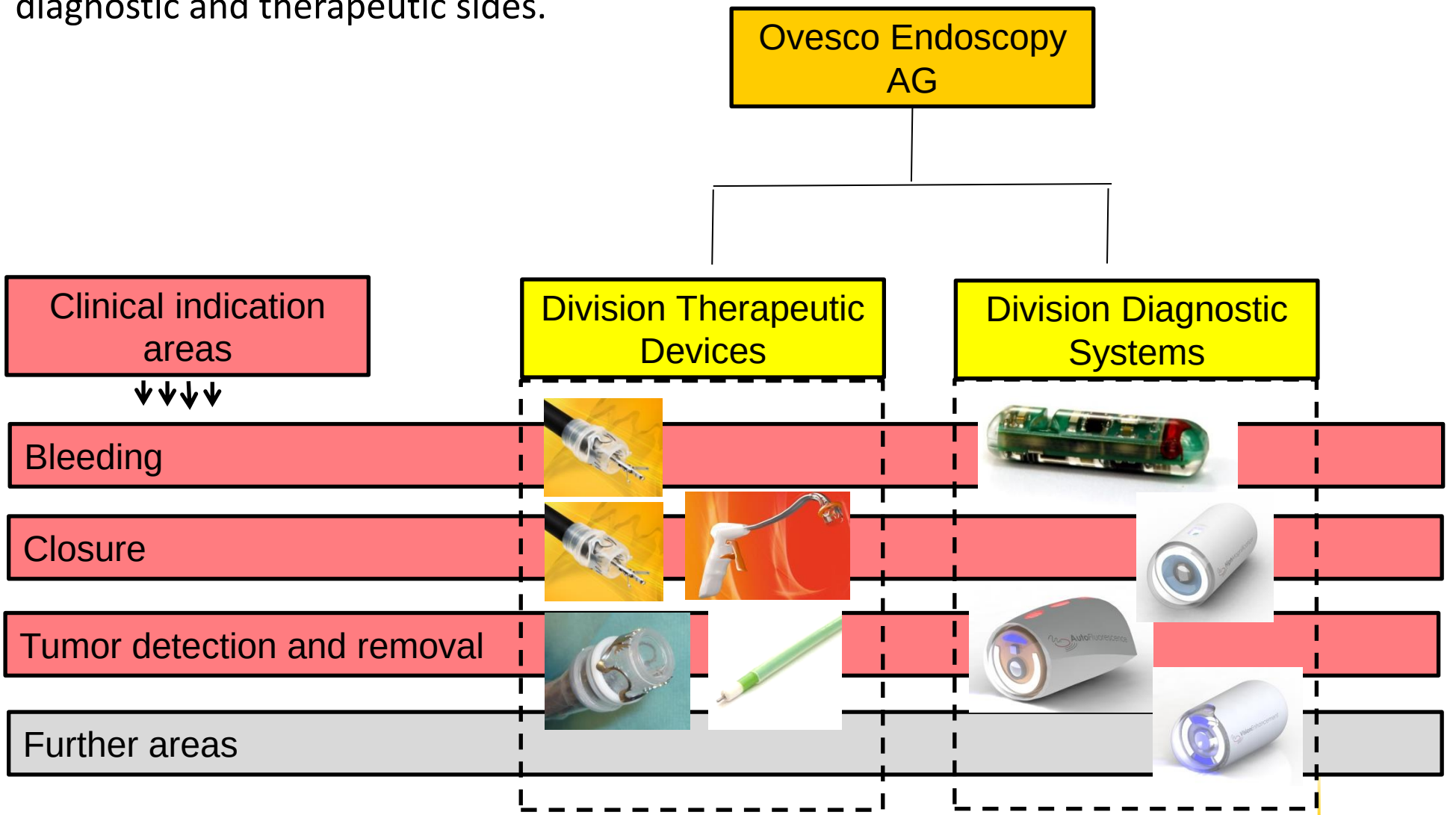




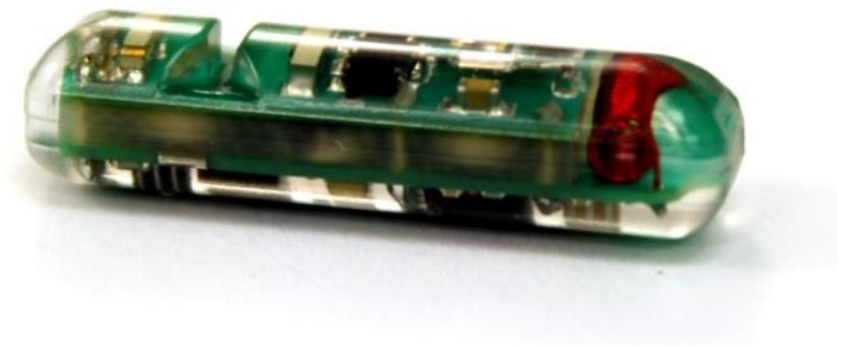


Today‘s competitors – an USD 600 million market in 2017, CAGR 8,7%

Both Ovesco divisions synergetically address the same clinical indication areas from both, diagnostic and therapeutic sides.



Innovation in wireless in-body devices: A field just starts to unfold



HEMOPILL ACUTE

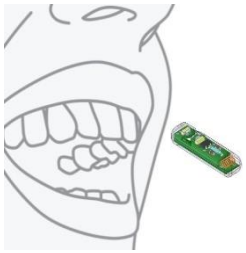
powered by VECTOR

HemoPill acute (market launch 2017): Quick check that can safe lives

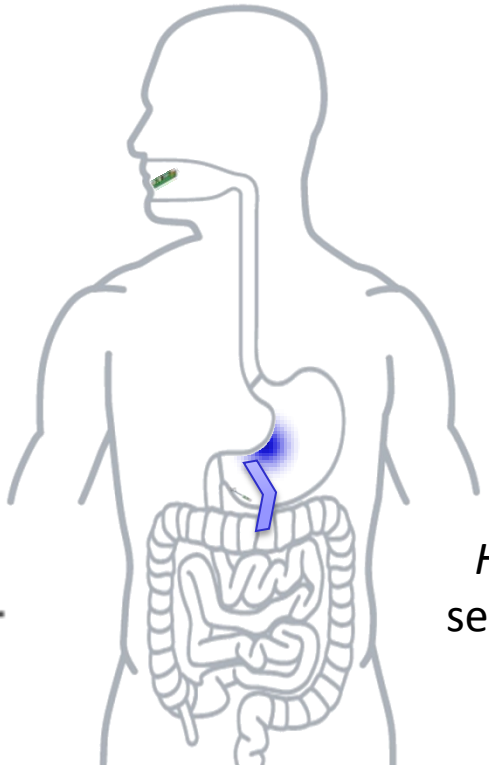
Application

Patient with suspected acute UGIB

Patient swallows
HemoPill acute



HEMOPILL ACUTE

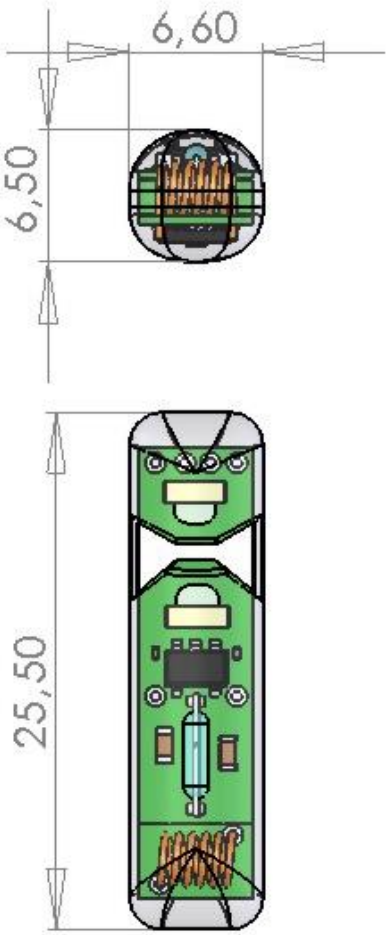


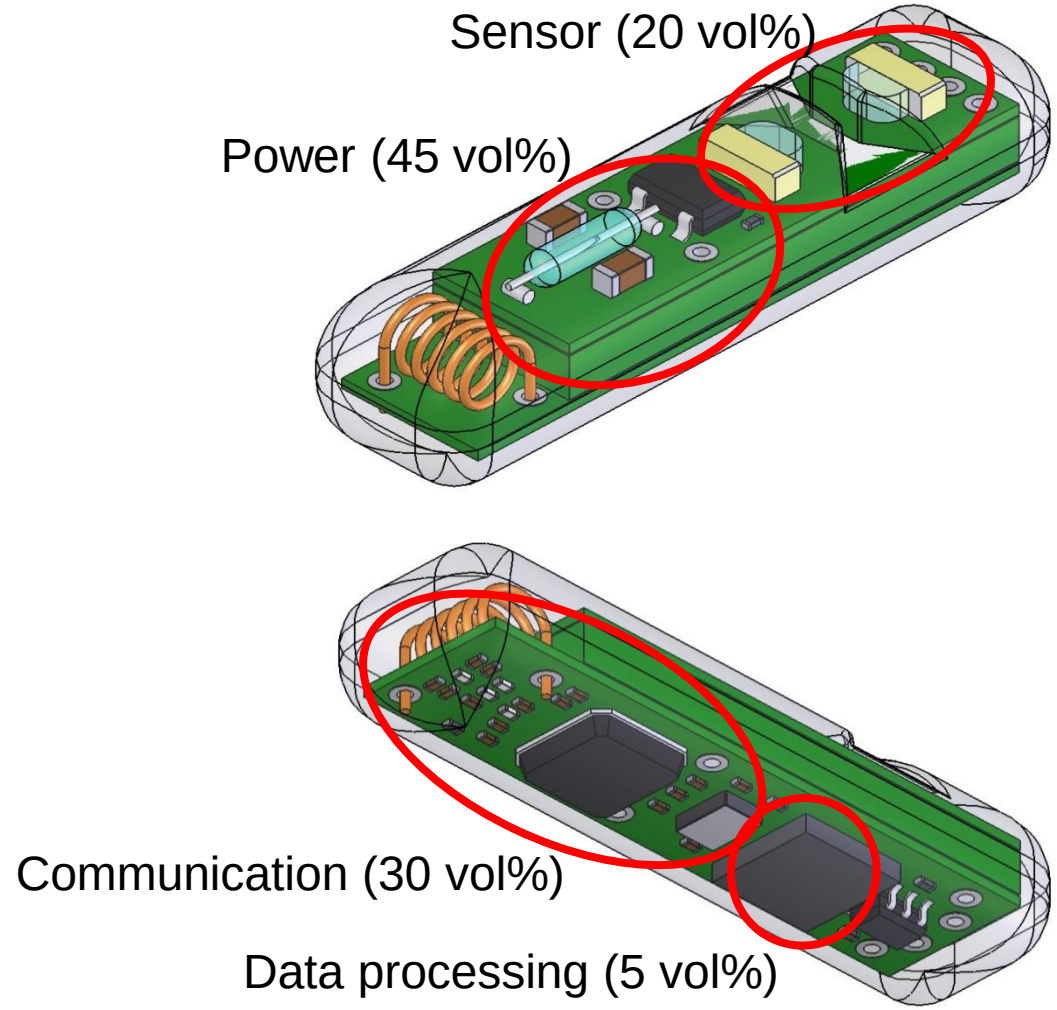
HemoPill acute
sends sensor data

Sensor data displayed on
the receiver in real-time

HEMOPILL RECEIVER

HemoPill: the world‘s smallest battery-powered telemetric in-body device

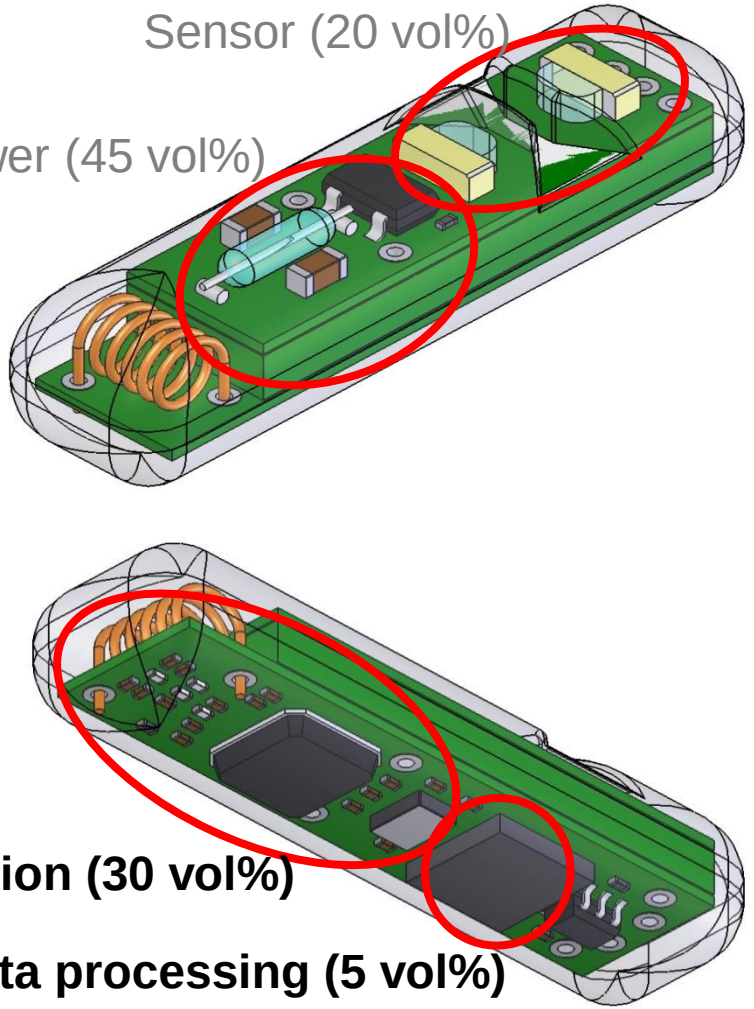




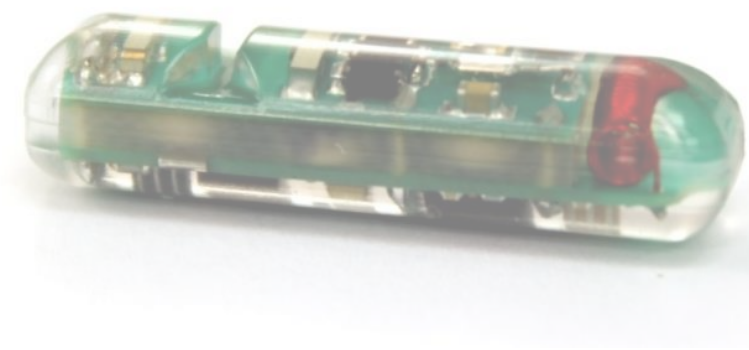
HemoPill: the world‘s smallest battery-powered telemetric in-body device

Data processing unit (comparable device):
- 20 MHz CPU
- 9 KB internal Memory
- 8 sensing channels
- Timers, comparators, serial interface, temperature sensor…
- Wireless communication speed: up to 600 kbit/s
- Dimension: 3mm x 3mm
- Price < 1 EUR

386 SX (1989):
- 16 MHz CPU
- 40MB internal Memory
- Communication speed: analog max. 40 kbit/s
- Price ~ 1000 EUR



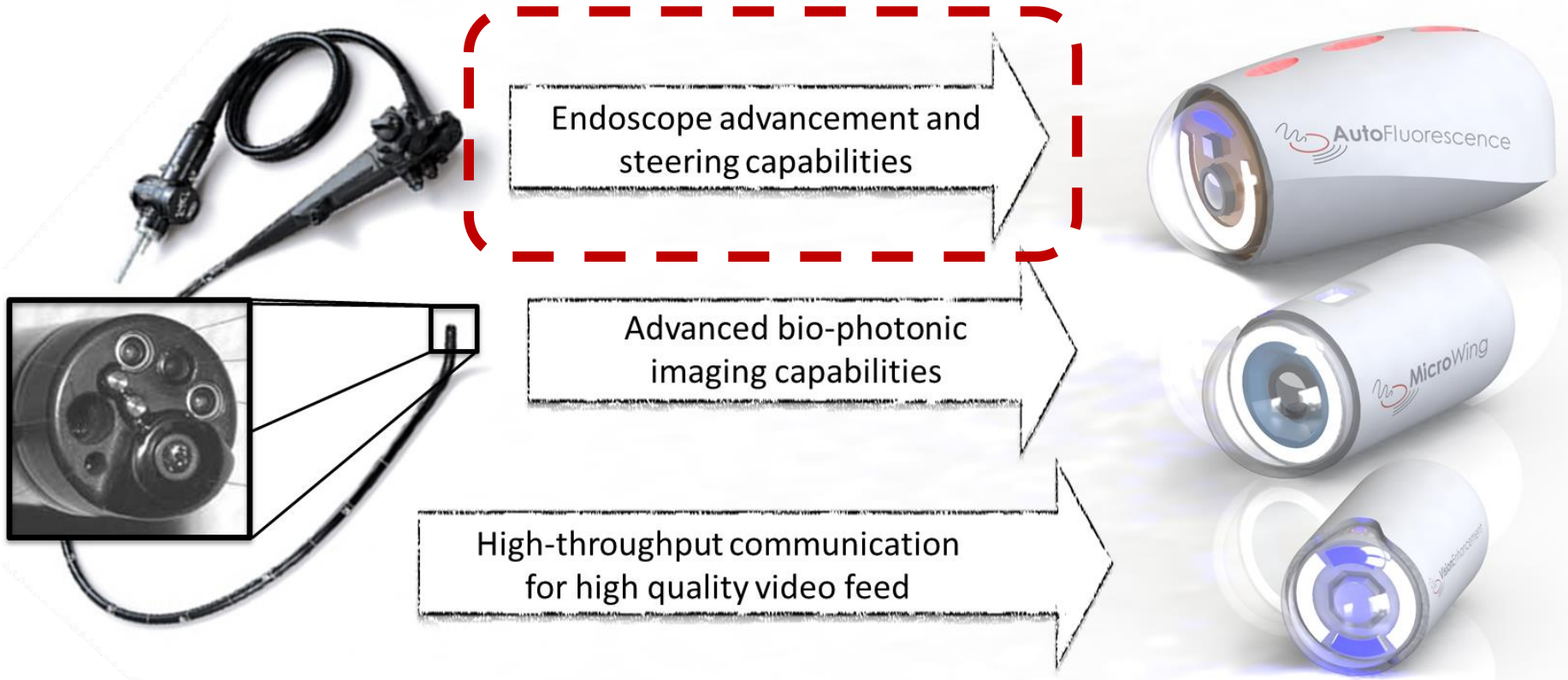
Innovation in wireless in-body devices: A field just starts to unfold



HEMOPILL
ACUTE

powered by VECTOR

Flexible endoscopy… coming of age?



Today‘s capsule endoscopes have its niche in the small bowel; flexible endoscopes cover >98% of procedures

Small bowel endoscopy: < 200k procedures p.a.

Colon and gastric screening: >10M procedures p.a.

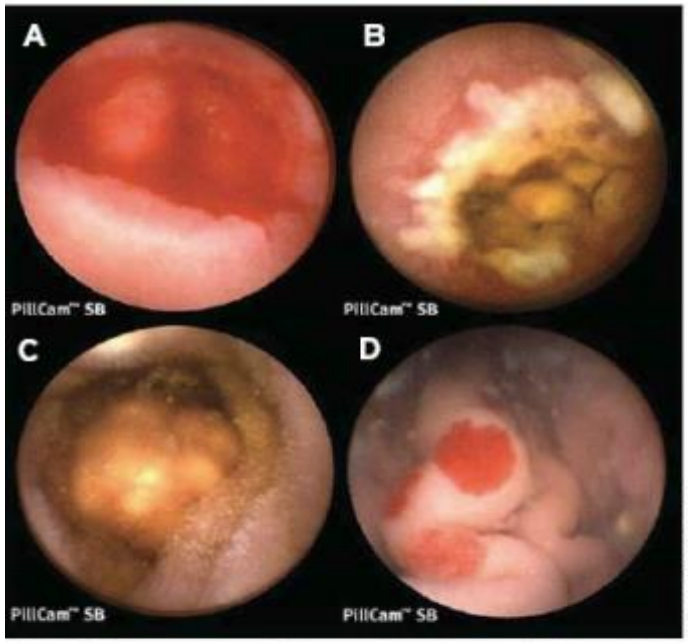
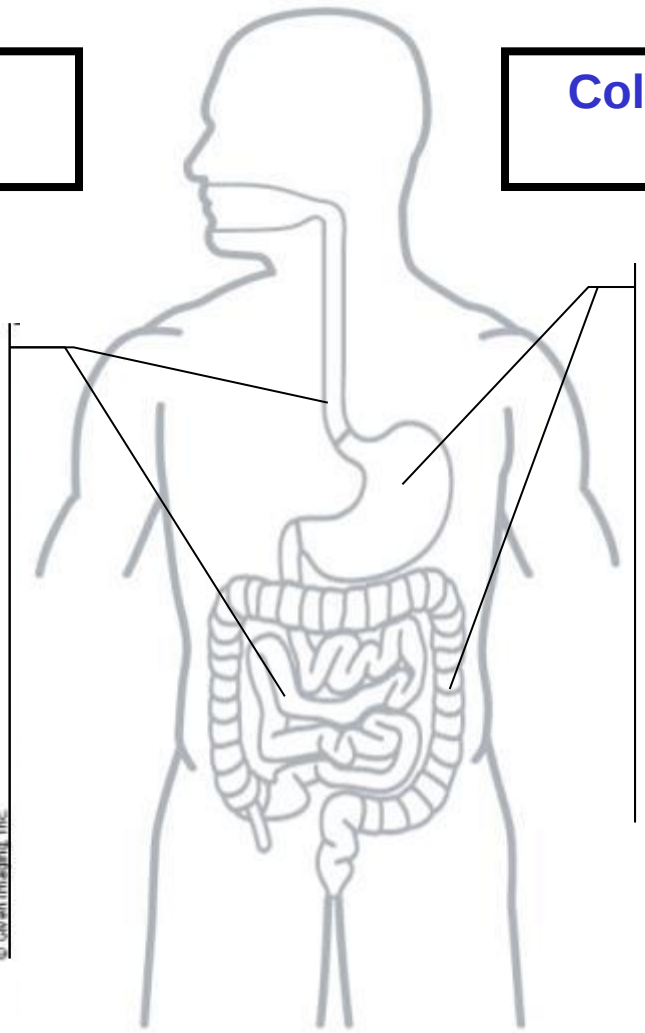
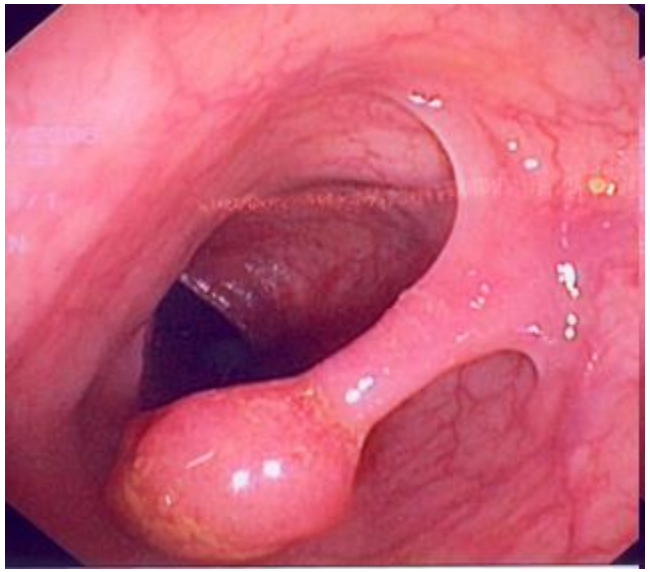


FIGURE 3. Images seen during capsule endoscopy include actively bleeding jejunal arteriovenous malformation (A), small bowel ulceration and luminal narrowing due to Crohn's disease (B), small bowel tumor (C), and multiple angiodysplasias (D).

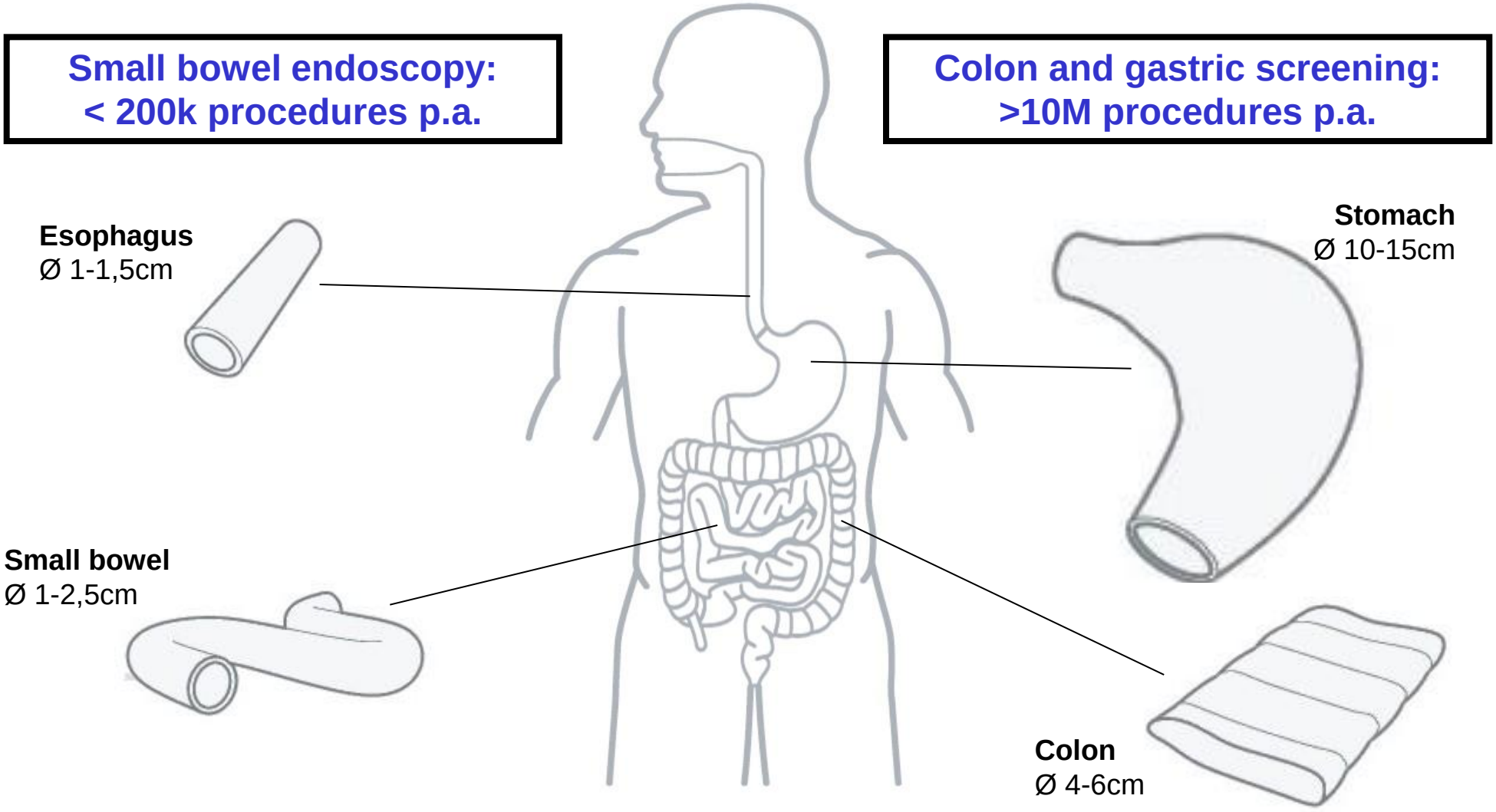




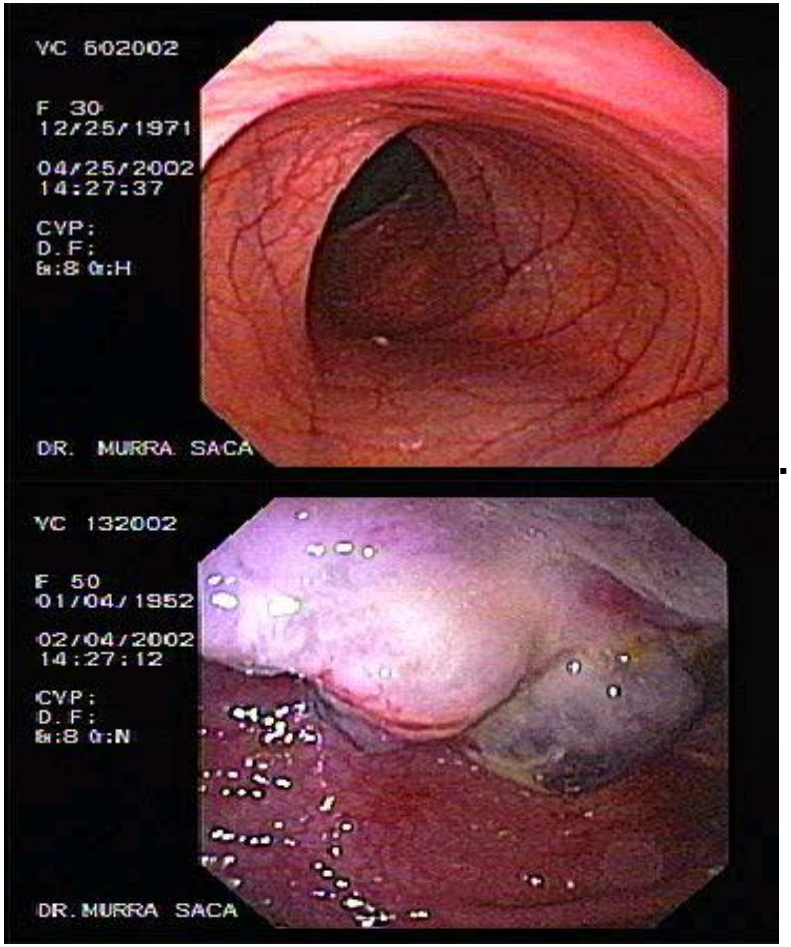
The organ caliber is main limitation of capsule endoscopy.

Small bowel endoscopy:
< 200k procedures p.a.

Colon and gastric screening:
>10M procedures p.a.



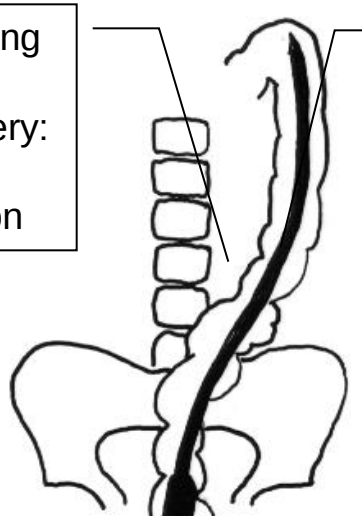
Flexible endoscopy is today indispensible for majority of digestive disease diagnoses



Healthy bowel mucosa

Invasive cancer

Stretching the mesentery: Pain creation



Stretching the bowel wall: Pain creation

Relatively few patients make use of the screening opportunity, due to:

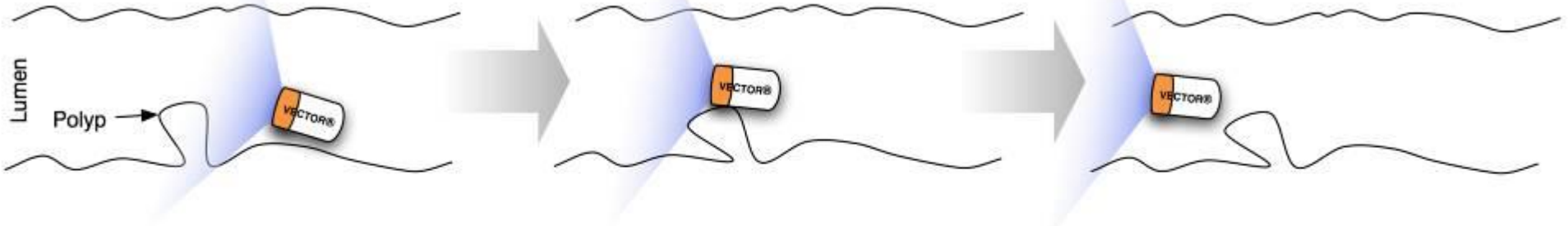
- Pain and discomfort during the procedure.

Evidence supporting the concept of early detection & treatment:

- **Screening endoscopy reimbursed in many EU healthcare systems**
- **Literature widely supports screening endsocopy**
- **Literature widely supports early treatment of pre-malignant and early malignant lesions**

Endoscopists need to be able to position the endoscopic device

Passive locomotion

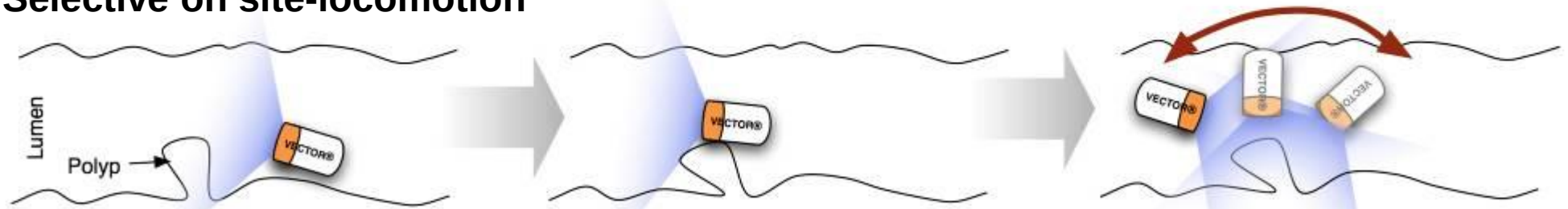


1) Detection of a suspicious lesion

2) Capsule is passing the lesion

3) Capsule has passed the lesion without gathering information

Selective on site-locomotion



1) Detection of a suspicious lesion

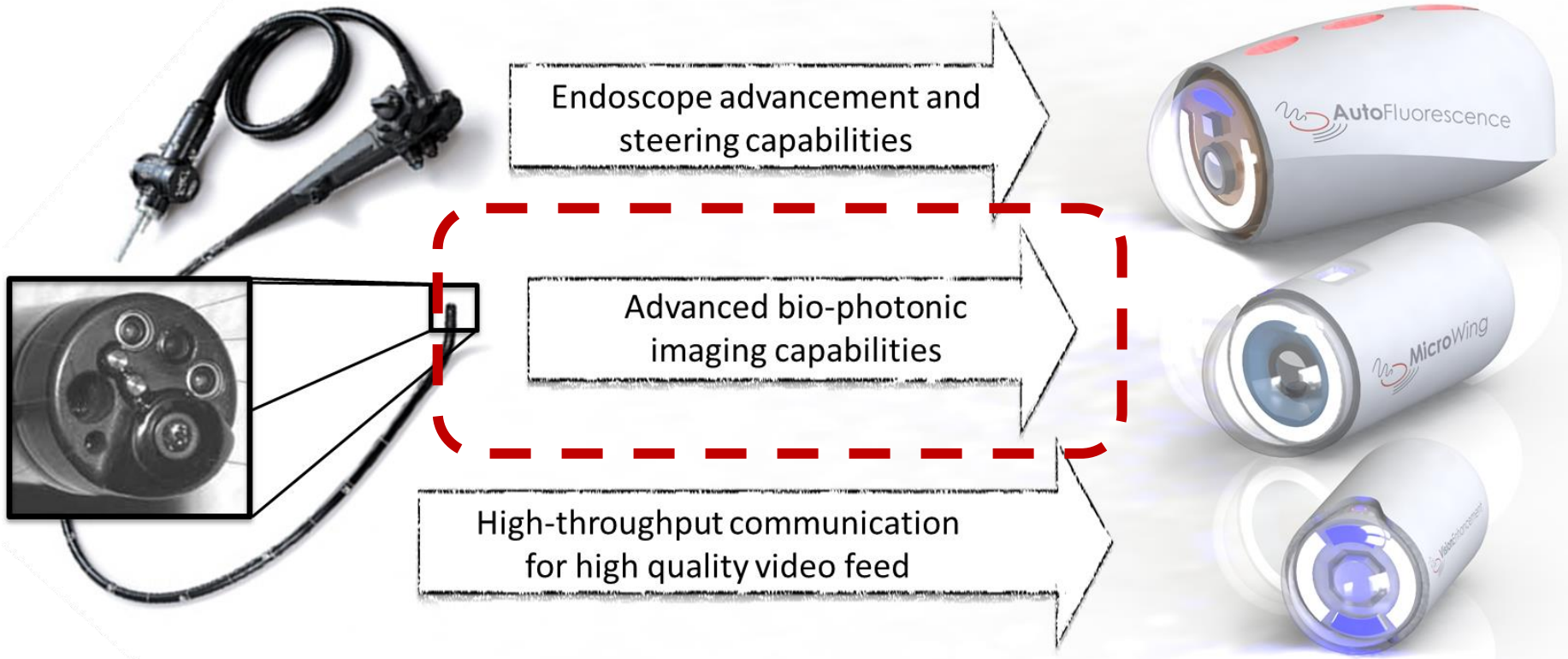
2) Capsule is passing the lesion

3) Capsule uses on-site locomotion to further investigate the lesion

VECTOR capsules can keep up with flexible endoscopes in terms of steering

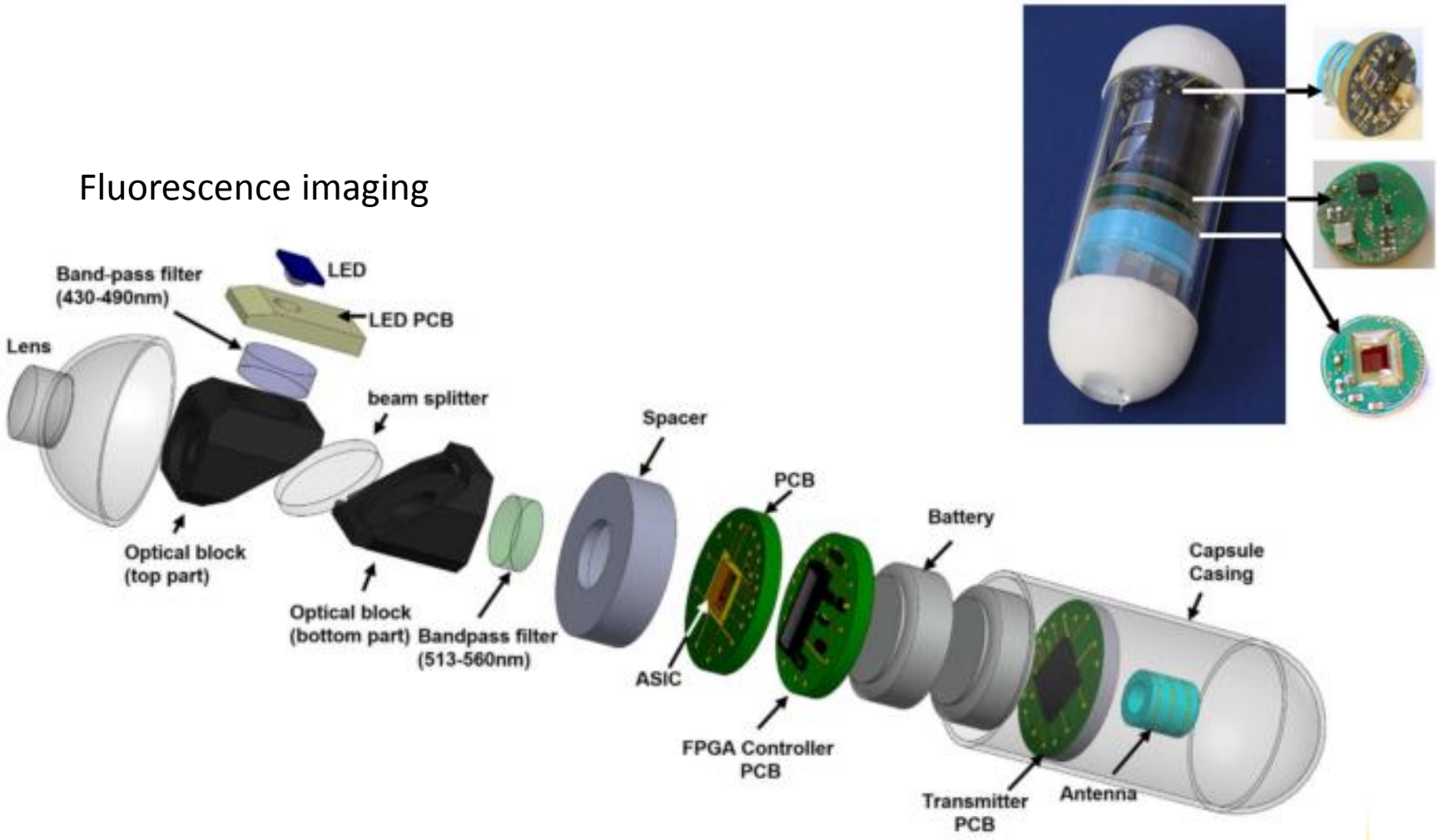
Magneto-robotic position control proves intuitive and allows capsule locomotion

Flexible endoscopy… coming of age?



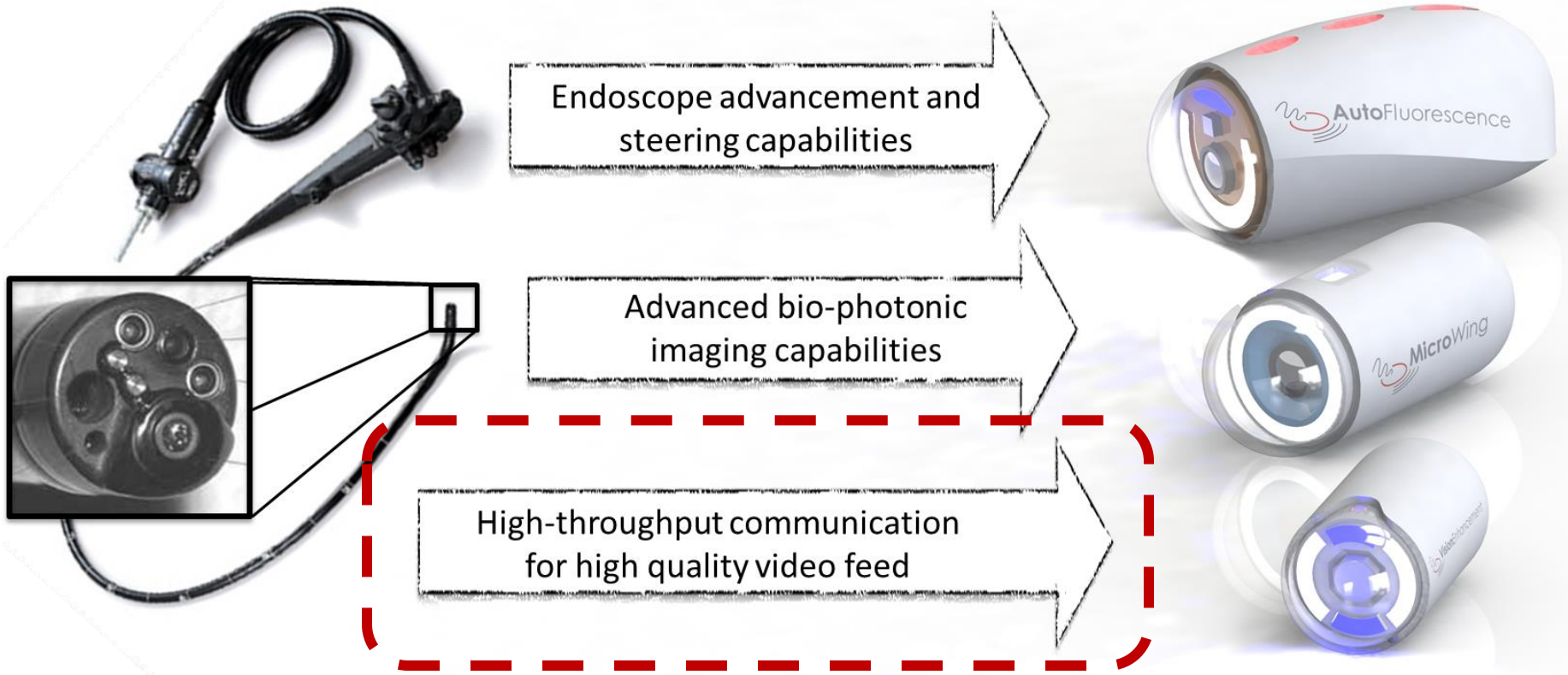
Imaging technology for integrated smart systems is unfolding

Fluorescence imaging



Al-Rawhani et al. 2015

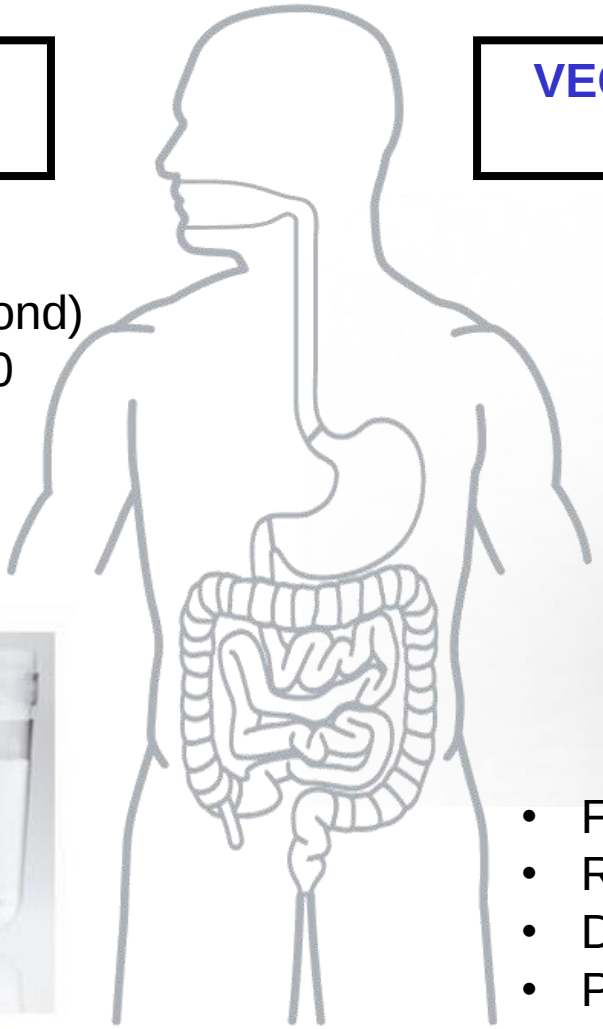
Flexible endoscopy… coming of age?



Technology is the bottle neck… every advancement results in inprovement!

Capsule endoscopy today: Obscure GI bleeding

- Single-shot imaging (2 per second)
- Resolution 250x250 to 320x320
- Datarate 2 Mbit/s
- Power consumption < ~10 mW



VECTOR capsule endoscopy: Fighting GI cancer

- Fluent video (> 11 fps)
- Resolution 720 x
- Datarate > 10 Mbit/s
- Power consumption < ~40 mW

Conclusion

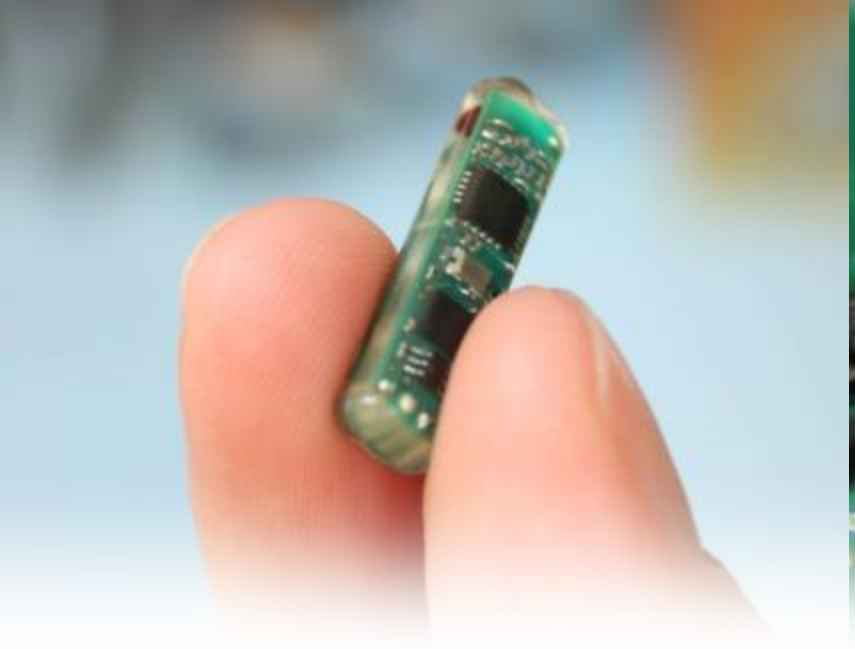
Wireless in medical applications is a true enabler – significant examples in digestive disease diagnosis

Exploitation of wireless technologies in healthcare is years behind other fields of applications

But…

Healthcare applications come with technological challenges (level of integration, low power, etc), therefore stimulate and boost research and innovation

… to be continued



THANK YOU!

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