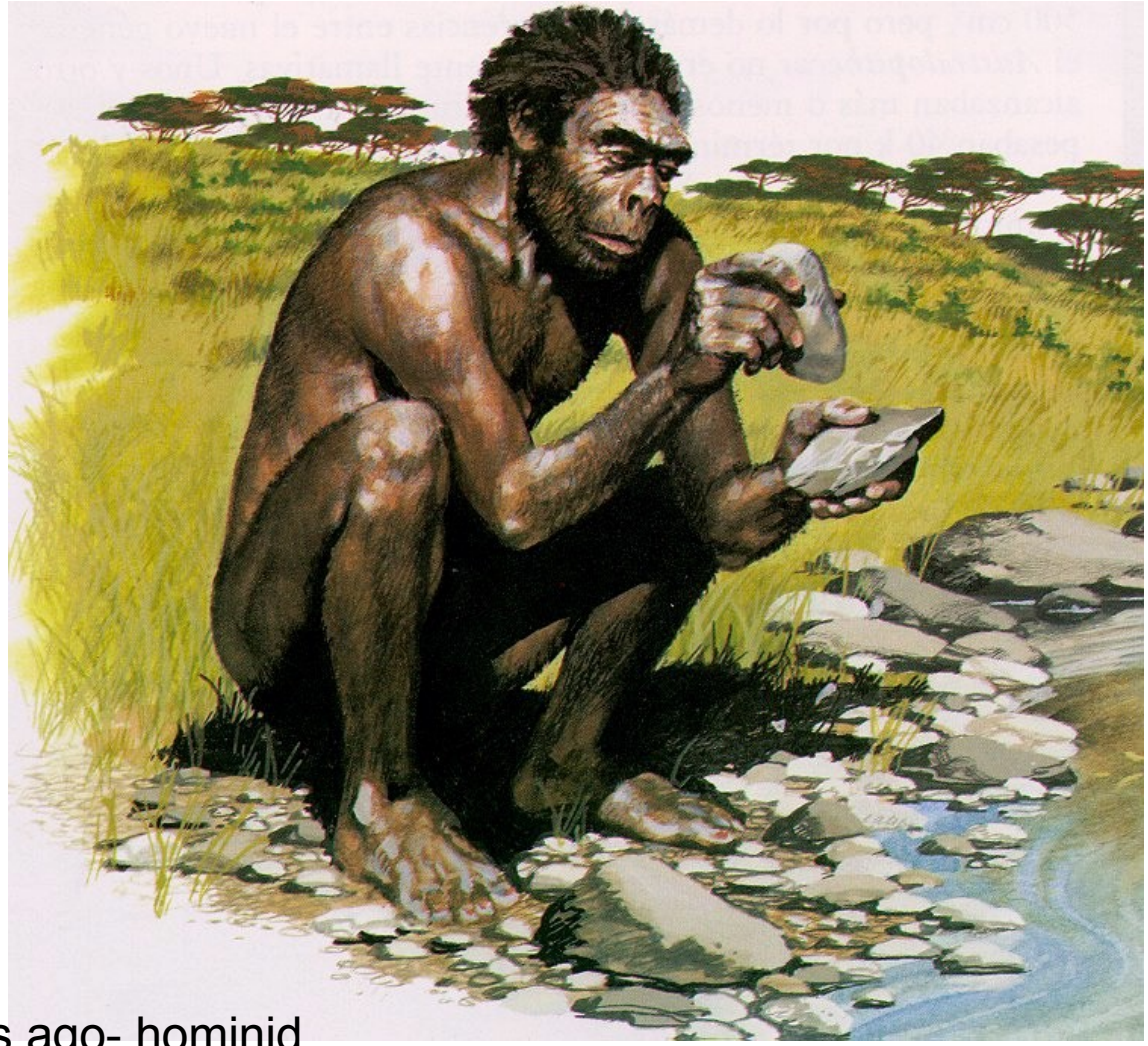
ERGONOMICS

Accommodation began with the creation of tools



1 million years ago- hominid

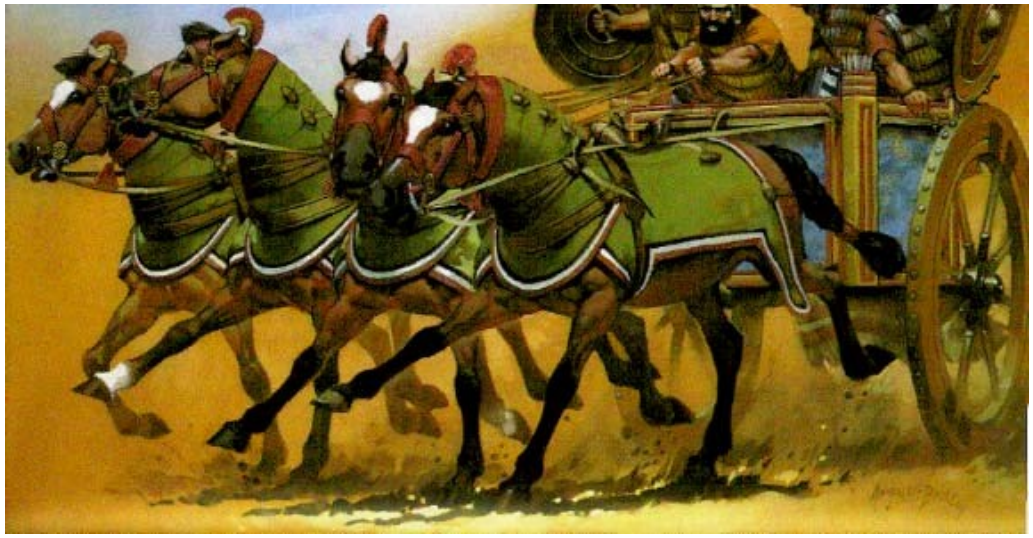
Bows & Arrows were designed

9000 years ago

Catal Huyuk, Turkey → Sharp, chipped edges were covered by plaster-like material

4000 years ago

Mohenjo-Daro,
Western Pakistan



Ancient Egyptians

Cubit
(elbow to the tip of the middle finger) was used for measuring

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Develop chairs, ventilated bed, chariots etc

Middle Ages (467-1453)

Measurement by body parts
(fists or half leg)

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Set the seat height
(5 fists or half leg)

Machine Age (200-100 years ago)

Machine assumed priority in design → Early aircraft was designed only for operator of certain sizes

Human Engineering/ human factors began

Before World War II → Engineer & Architects had some guidelines (space required to climb, space for maintenance etc)

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Based on the **Average Man**

World War II

Department of Defense issued HE Standard > military equipments

Base on 90% of the adult males acceptable for certain segments

1960s

Systematic data gathering > U.S Department of Health, Education & Welfare

1970s

Society of Automotive Engineer > Made survey of children (2-months infant-18-year-old youths)

1980s

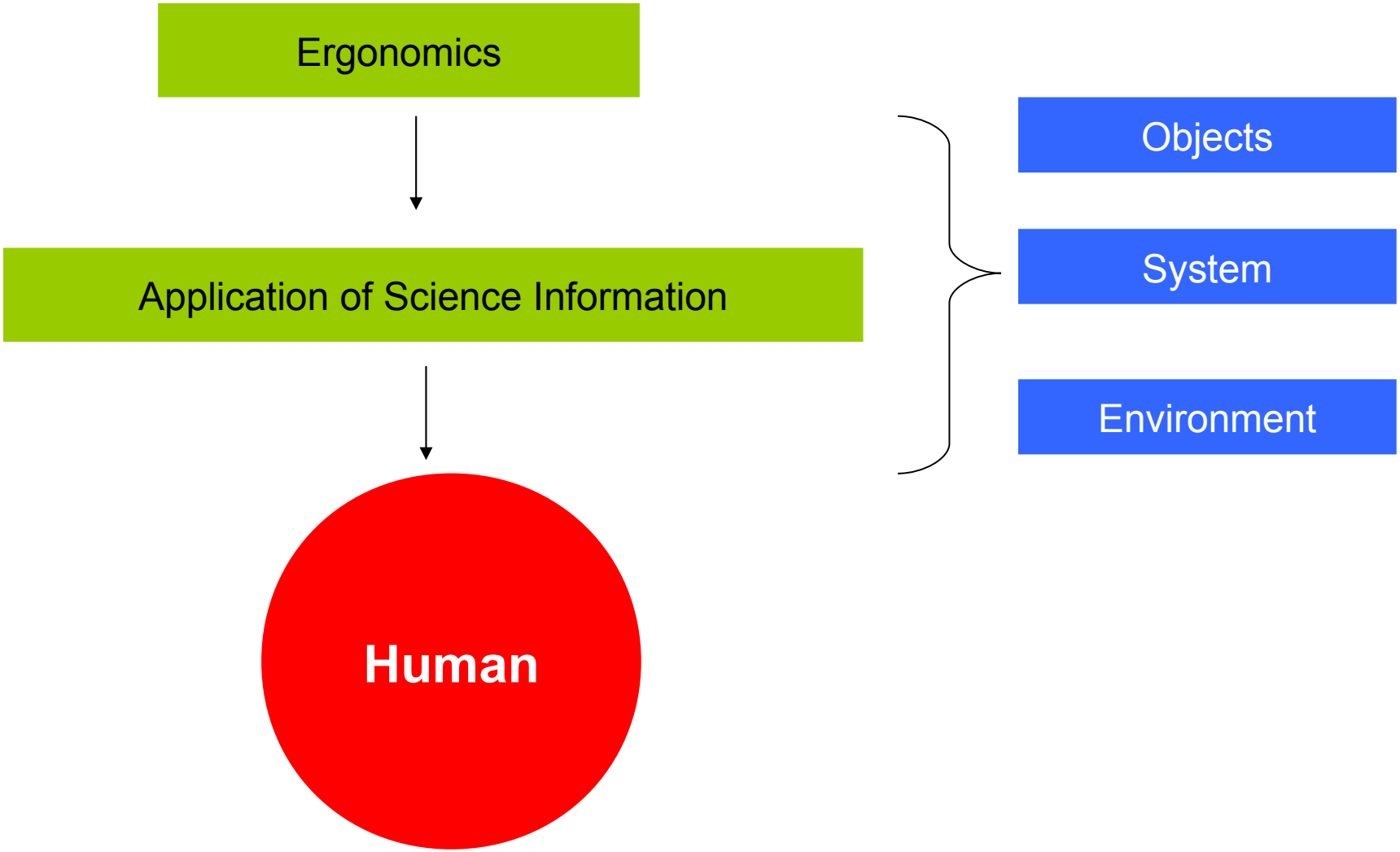
Elderly

1990s

American with Disabilities (ADA)

What is Ergonomics?

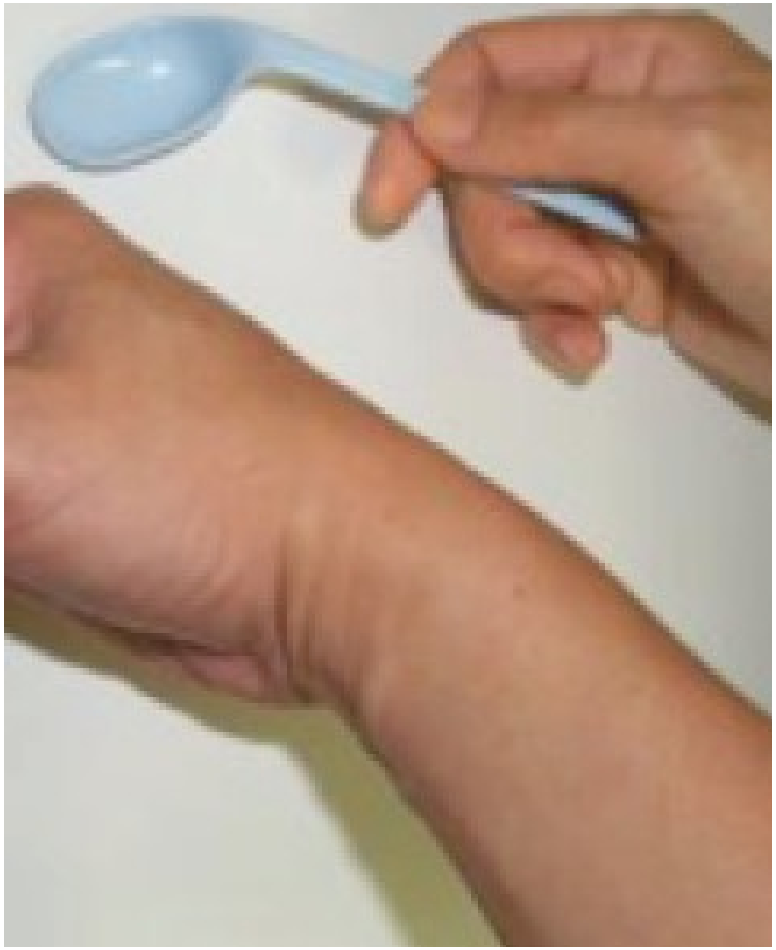
- Ergonomics is the application of **scientific information** concerning **humans** to the design of objects, systems and environment for **human use**. Ergonomics comes into everything which involves people. Work systems, sports and leisure, health and safety should all embody ergonomics principles if well designed.


Ergonomics
Application of Science Information
Human
Objects
System
Environment

Ergonomics is about using knowledge of human abilities and limitations to design and build for comfort, efficiency, productivity and safety.

Why is Ergonomics needed?

The overall aim is to ensure that our knowledge of human characteristics is brought to bear on practical problems of people at work and in leisure. We know that, in many cases, **humans can adapt to unsuitable conditions**, but such adaptation leads often to inefficiency, errors, unacceptable stress, and physical or mental cost.

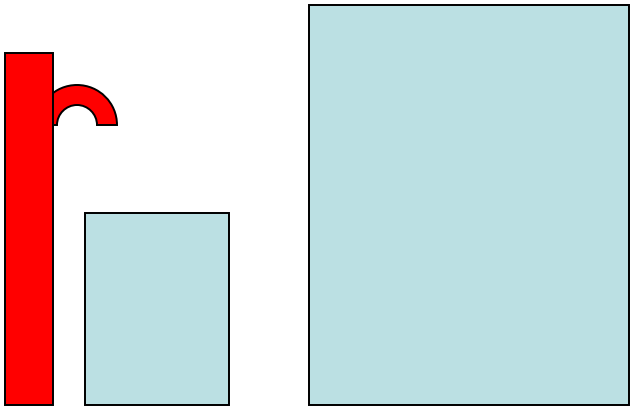


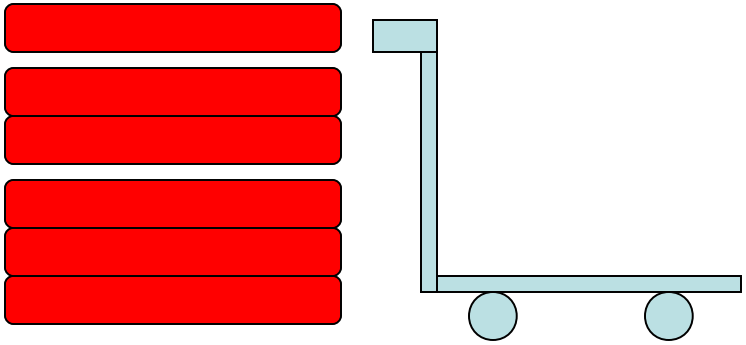
Ergonomics has a wide application to everyday domestic situations, but there are even more significant implications for efficiency, productivity, safety and health in work settings. For example:

- **Designing equipment and systems including computers**,
- so that they are easier to use and less likely to lead to errors in operation – particularly important in high stress and safety-critical operations such as control rooms.

- Designing tasks and jobs so that they are effective and take account of human needs such as rest breaks and sensible shift patterns, as well as other factors such as intrinsic rewards of work itself.

- **Designing equipment and work arrangements** to improve working posture and ease the load on the body, thus reducing instances of Repetitive Strain Injury/Work Related Upper Limb Disorder.





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➢**Information design**, to make the interpretation and use of handbooks, signs, and displays easier and less error-prone.

Design of training arrangements to cover all significant aspects of the job concerned and to take account of human learning requirements.

The design of military and space equipment and systems – an extreme case of demands on the human being. Designing working environments, including lighting and heating, to suit the needs of the users and the tasks performed. Where necessary, design of personal protective equipment for work and hostile/adverse environments.

The components of ergonomics

Ergonomics deals with the interaction of technological and work situations with the human being. The basic human sciences involved are

- **anatomy,**
- **physiology and**
- **psychology**,

These sciences are applied by the ergonomist towards two main objectives:

the most productive use of human capabilities, and

the maintenance of human health and well-being.

In a phrase, the job must ‘fit the person’ in all respects, and the work situation should not compromise human capabilities and limitations.

Basic anatomy

• improving physical 'fit' between people and the things they use, ranging from hand tools to aircraft cockpit design. Achieving good physical fit is no mean feat when one considers the range in human body sizes across the population. The science of anthropometrics provides data on dimensions of the human body, in various postures.

•Biomechanics considers the operation of the muscles and limbs, and ensures that working postures are beneficial, and that excessive forces are avoided.

Human physiology

Work physiology

addresses the energy requirements of the body and sets standards for acceptable **physical workrate and workload**, and for nutrition requirements.

Environmental physiology

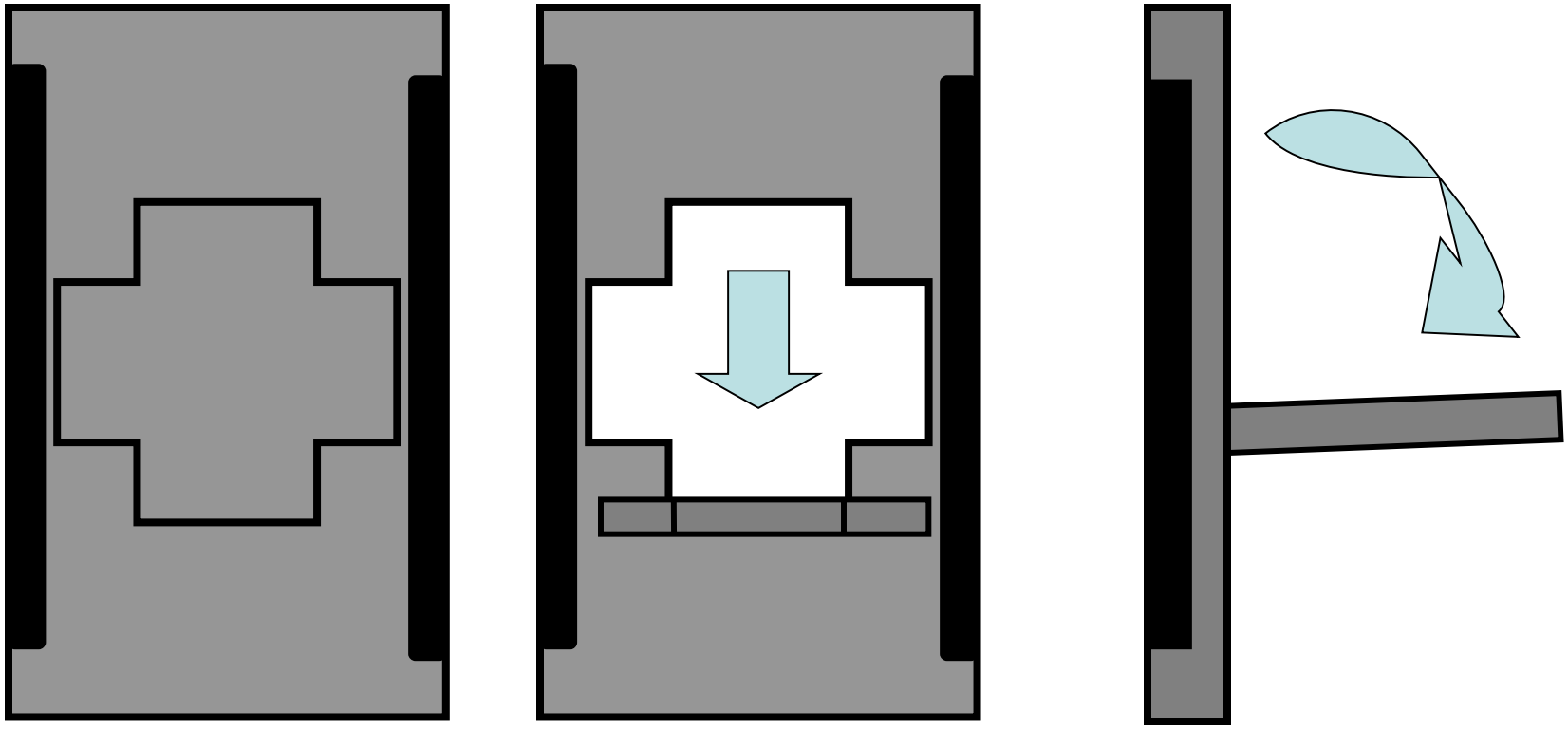
analyses the **impact of physical working conditions** – thermal, noise and vibration, and lighting – and sets the optimum requirements for these.

Psychology

is concerned with human information processing and decision-making capabilities. In simple terms, this can be seen as aiding the cognitive 'fit' between people and the things they use.

Relevant topics are **sensory processes, perception, long- and short-term memory, decision making and action**.

The components of ergonomics

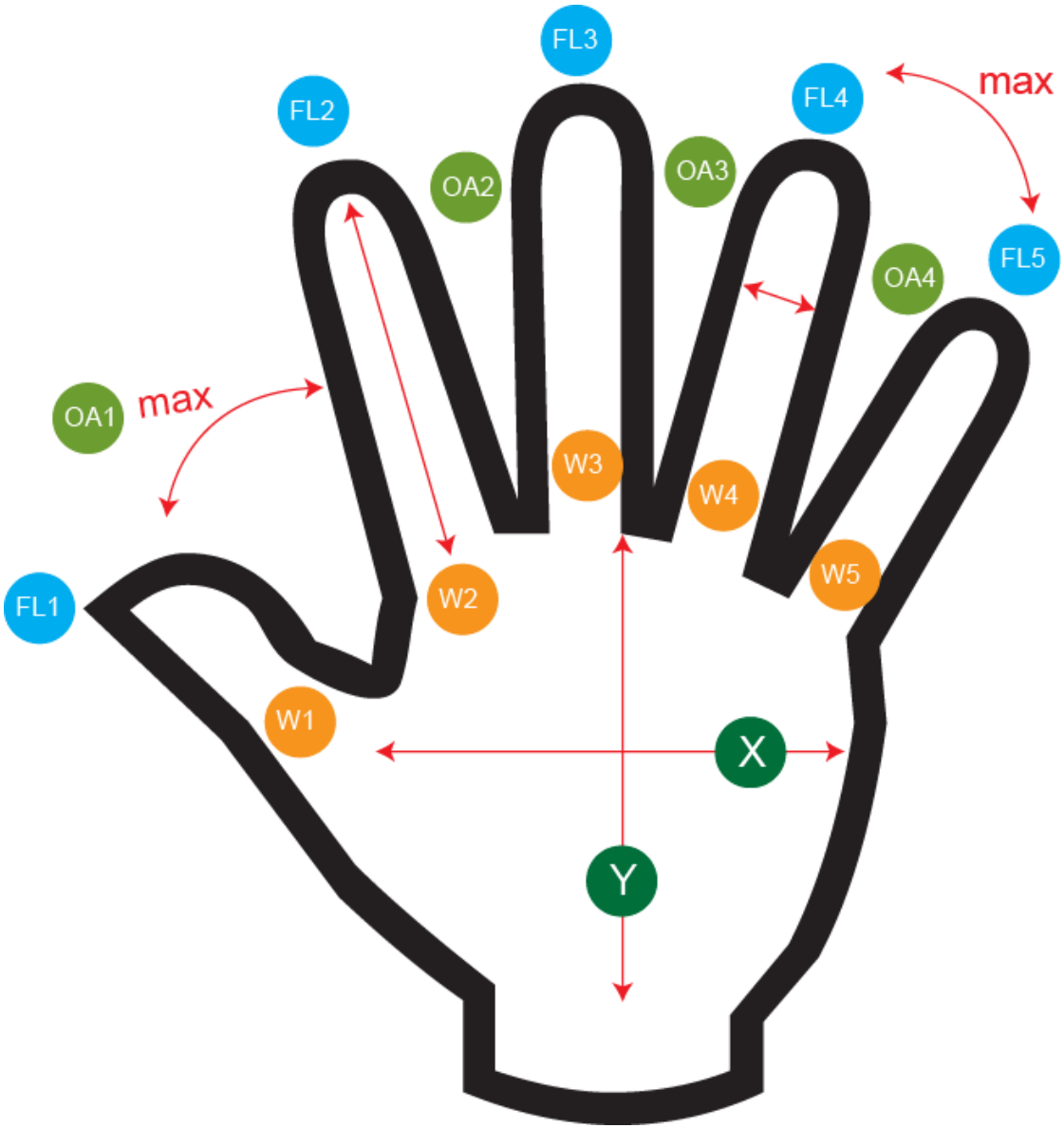


The ergonomics approach – understanding tasks … and the users

Underlying all ergonomics work is careful analysis of **human** activity. The ergonomist must **understand all of the demands** being made on the person, and the **likely effects of any changes to these** – the techniques which enable him to do this come under the portmanteau label of 'job and task analysis'.

The second key ingredient is to **understand the users**. For example, 'consumer ergonomics' covers applications to the wider contexts of the home and leisure. In these non-work situations the need to allow for human variability is at its greatest – the people involved have a very wide range of **capabilities and limitations** (including the disabled and elderly), and seldom have any selection or training for the tasks which face them.

What’re the problems?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