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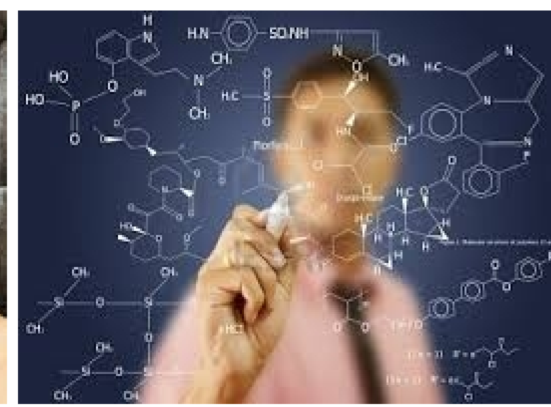
Escritura Científica

Maria Belén Rodríguez-Fonseca



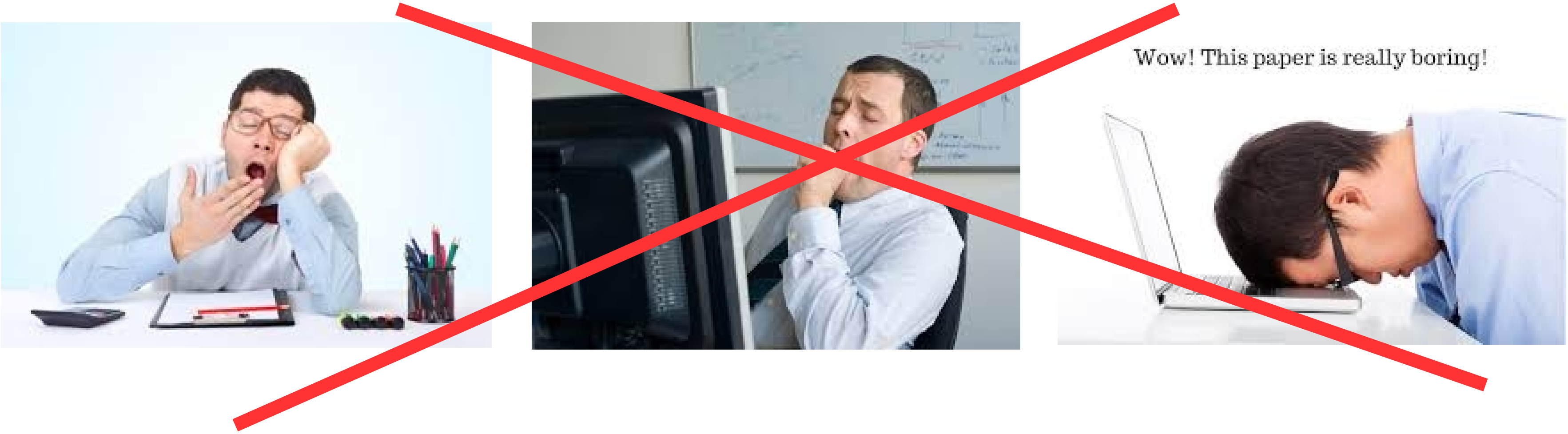


"In science, the credit goes to the man who **convinces** the world, not to the man to whom the idea first occurs."

--Sir William Osler

"Writing is an art. But when it is writing to inform it comes close to being a science as well."

--Robert Gunning,*The Technique of Clear Writing*


Wow! This paper is really boring!

¿Qué trabajo ?

- Escribir el TFM
- Escribir un informe de clase
- Escribir un TFG
- Escribir un informe de PE
- Escribir un artículo científico

A escribir se aprende escribiendo

- Práctica, práctica, práctica
- Elegir un buen modelo
- Estudiar buenos ejemplos
- **PERO...pero hay alguna técnicas y consejos**

Se te va a juzgar por lo que escribas

Contenido

Estructura

Estilo

Tip 3 – Introduction: work on that funnel shape!

Comunicar bien es crucial para tu carrera

How to pitch articles to editors

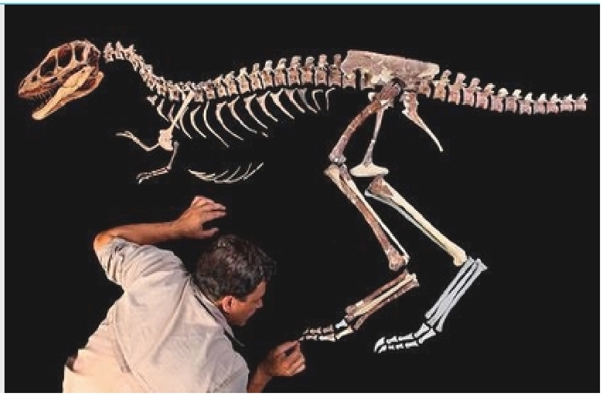
James Randerson: Pitching stories to magazine and newspaper editors is tough, but there is a lot you can do to improve your chances of success

7:00 AM

How to report from a science conference

Robin McKie: They can break momentous science news, but conferences are also ideal for meeting scientists and fellow writers - and escaping the drudgery of desk work

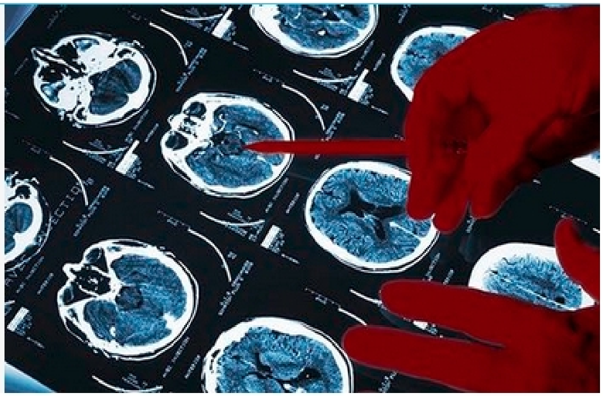
7:00 AM

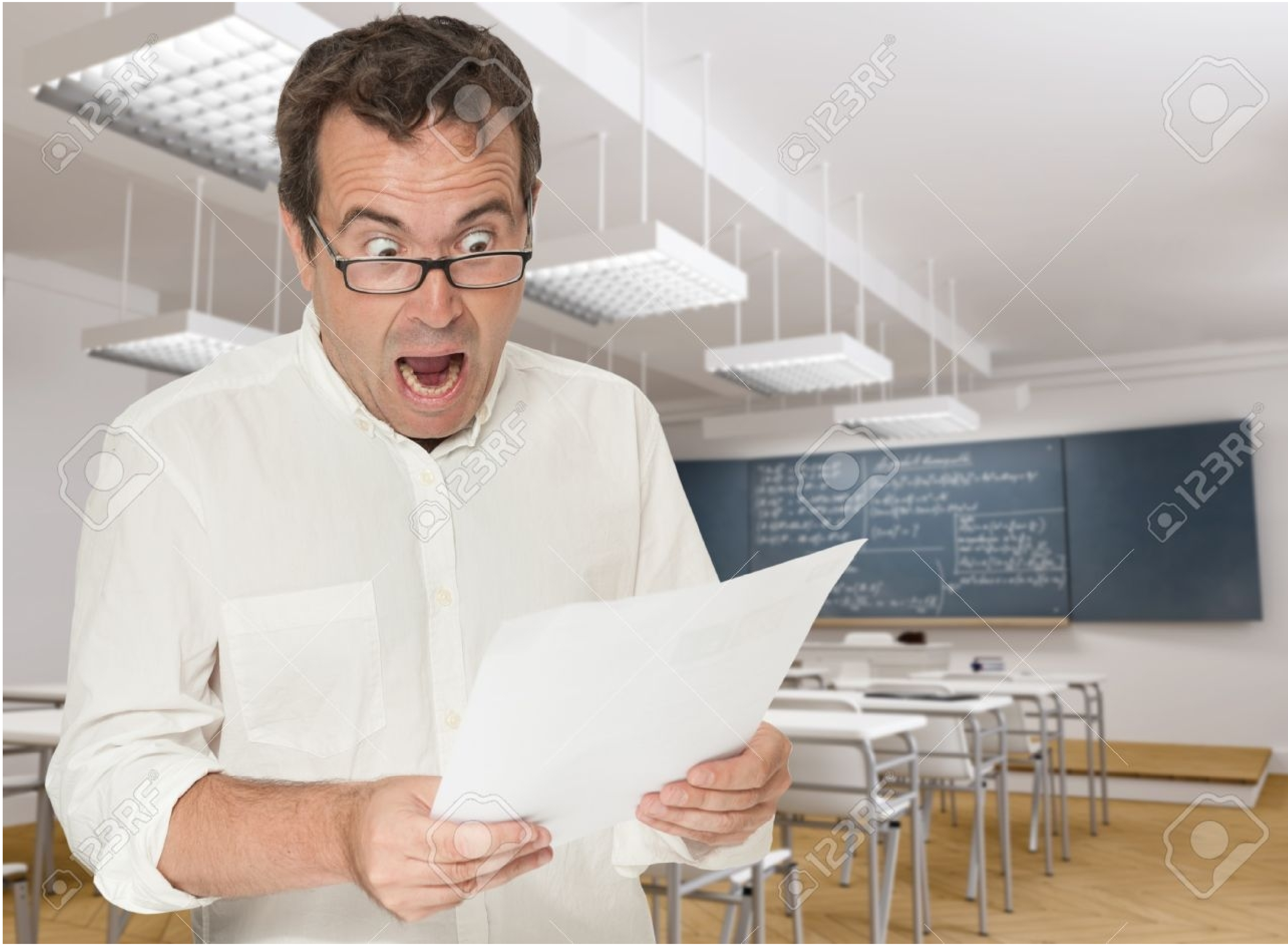


How to avoid common mistakes in science writing

Akshat Rathi: As the deadline looms for entries to the Wellcome Trust Science Writing Prize, these tips will help you avoid eight common pitfalls

7:00 AM 18




123RF

Estructura del Taller

- DIA 1
  - Introducción
  - Contenido y Estilo
  - Como Estructurar un trabajo
    - Parte introductoria
    - Parte media
    - Final
    - Apéndices

- DIA 2: Formato
  - Figuras y Tablas
  - Pies de figuras y Tablas
  - Tipografía
  - Ecuaciones
  - Referencias

- Ambos días: veremos ejemplos

Además de esta charla te recomiendo:

Lee, presta atención a otros e imita

Habla de tu trabajo con otros antes de escribir

Desarrolla un hábito de “tesaurus”

Busca las palabras adecuadas que describan lo que quieres comunicar

Repeta a la audiecia que te lee. No les aburras. Empatiza

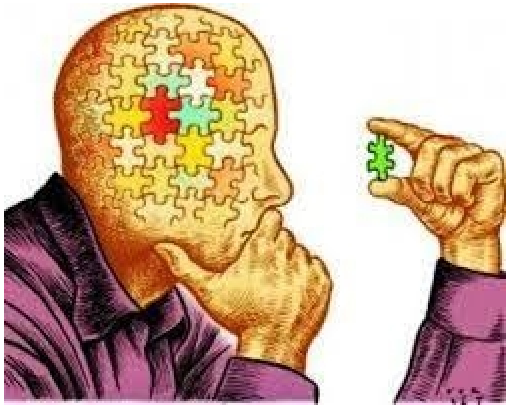
Acepta que es difícil y respeta que es importante hacerlo bien.

No vale un buen resultado. Hay que saber comunicarlo

Introducción

Antes de empezar a escribir..pregúntate

¿Qué quiero decir?



Cuando acabes de escribir..pregúntate:

¿ He transmitido lo que quería?

Lo bien que comuniques afectará a

-tu futuro

-opinión pública

-toma de decisiones

-sociedad

Un buena forma de mejorar tu escritura es tener buenos referentes

Physics and Mathematics

Check out these authors to teach yourself about the rules of matter, motion and the particles that make up the universe as we know it.

1. **Richard Feynman**: Nobel Prize-winning Physicist Richard Feynman was one of the best-known scientists in the world during his time, and is still widely known today for his work in quantum mechanics, particle physics and superfluidity. Besides being a whiz in the lab, Feynman helped to popularize the subject through his books and lectures, most notably in *The Feynman Lectures on Physics*.

2. **Michio Kaku**: Few have brought physics into popular culture like Michio Kaku. His books *Physics of the Future* and *Parallel Worlds* , among others, have helped to make him a well-known figure and cemented his role in the history of scientific writing.

3. **Steven Weinberg**: This Nobel Laureate in physics has written a number of books that address everything from the fundamentals of cosmology to the discovery of subatomic particles. His research has helped the field make great strides, and his work is well worth a read.

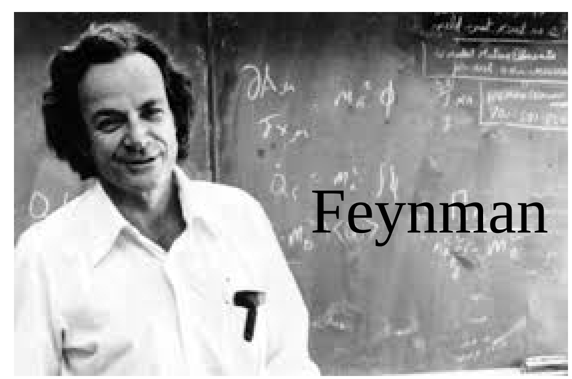
4. **Albert Einstein**: Famous the world over and possessing a name that's synonymous with genius, this physicist's theories helped to change the way scientists thought about time, space and bodies in motion. His publications on relativity are well worth a read for anyone, as he uses powerful examples to explain some of the more difficult concepts.

5. **Erwin Schrodinger**: Best known for his work in physics, which won him a Nobel Prize, Schrodinger's work covers topics from that field to the biological sciences. His most popular works include *What Is Life?* and *The Interpretation of Quantum Mechanics*.

6. **Ian Stewart**: A great promoter of mathematics, Ian Stewart has won awards for his books that bring math and science to a popular audience. Sci-fi fans will love his *Science of Discworld* series and math geeks will appreciate his texts like *Nature's Numbers*.

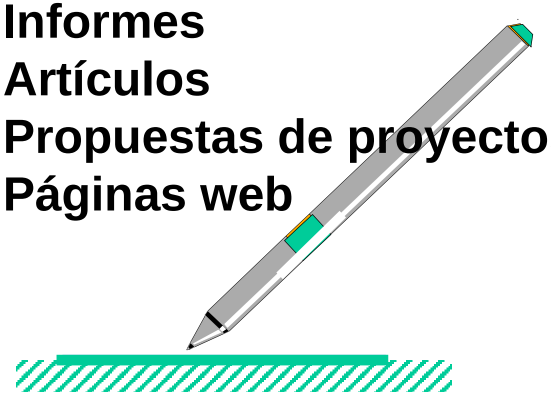
7. **Steven Strogatz**: This mathematician's work has been applied to diverse fields like sociology, business and epidemioloy His writings help make even the most complex topics accessible, interesting and even emotionally compelling.

http://www.onlinecollege.org/2011/05/22/the-50-best-science-writers-of-all-time/



Un científico tiene que comunicar en muchas situaciones diferentes

Informes
Artículos
Propuestas de proyectos
Páginas web



Conferencias
Clases
Reuniones
Pósters

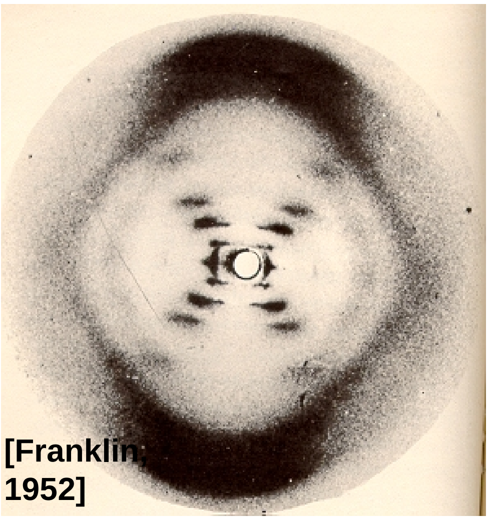
Audiencia técnica especifica

Audiencia Técnica general

Audiencia general

La escritura científica se diferencia del resto de escrituras

El tema importa:precisión

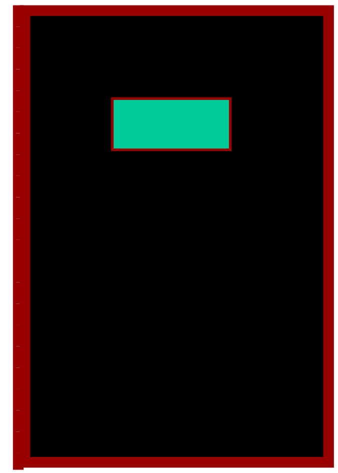


structure of DNA

Restricciones

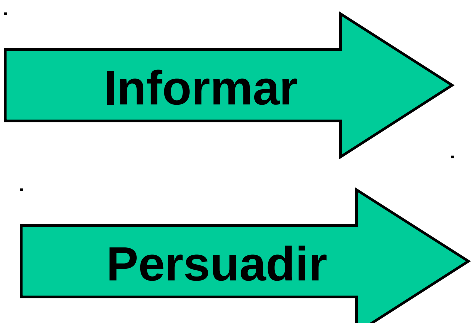
audiencia

objetivo

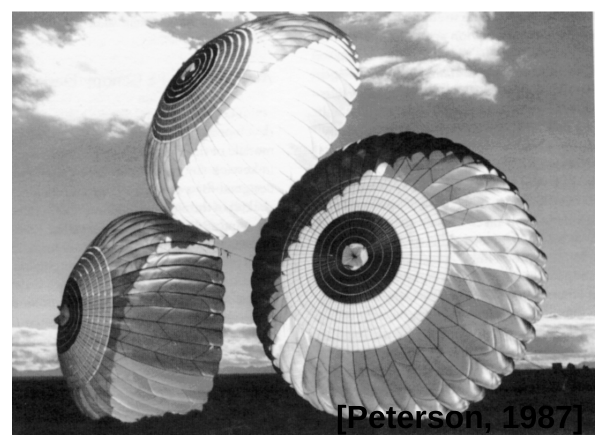


ocasión

Objetivo de Escribir



Estilo

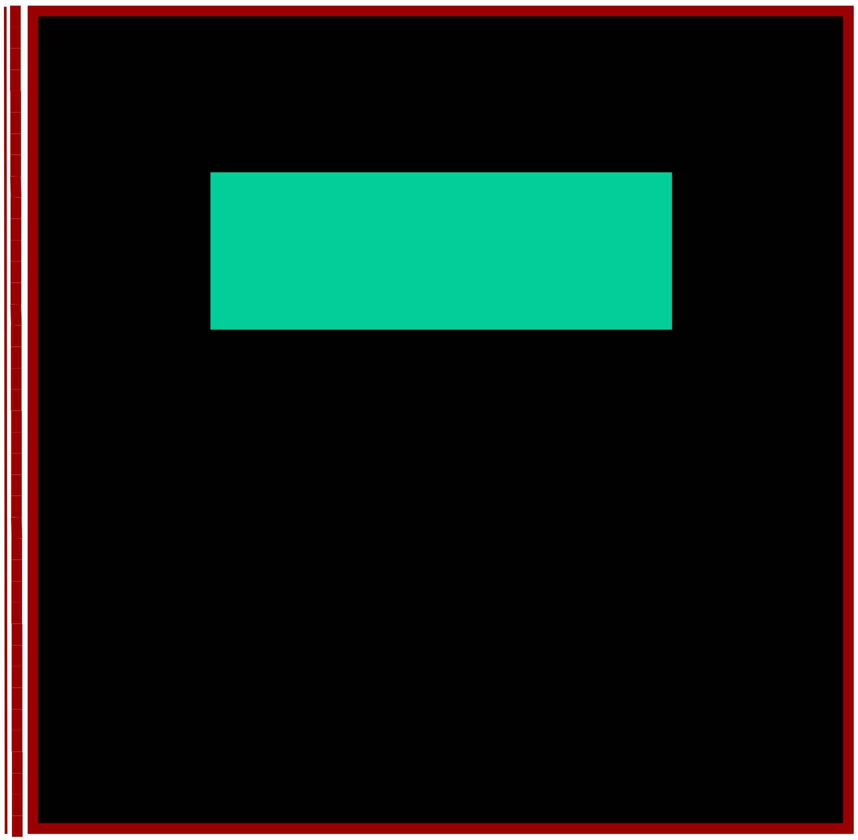


Hay que analizar las restricciones

Audiencia

¿A quien escribes?

¿Qué es lo que ya saben?



¿Por qué leen lo que has escrito?

¿Cómo lo van a leer?

Formato (Formalidad)

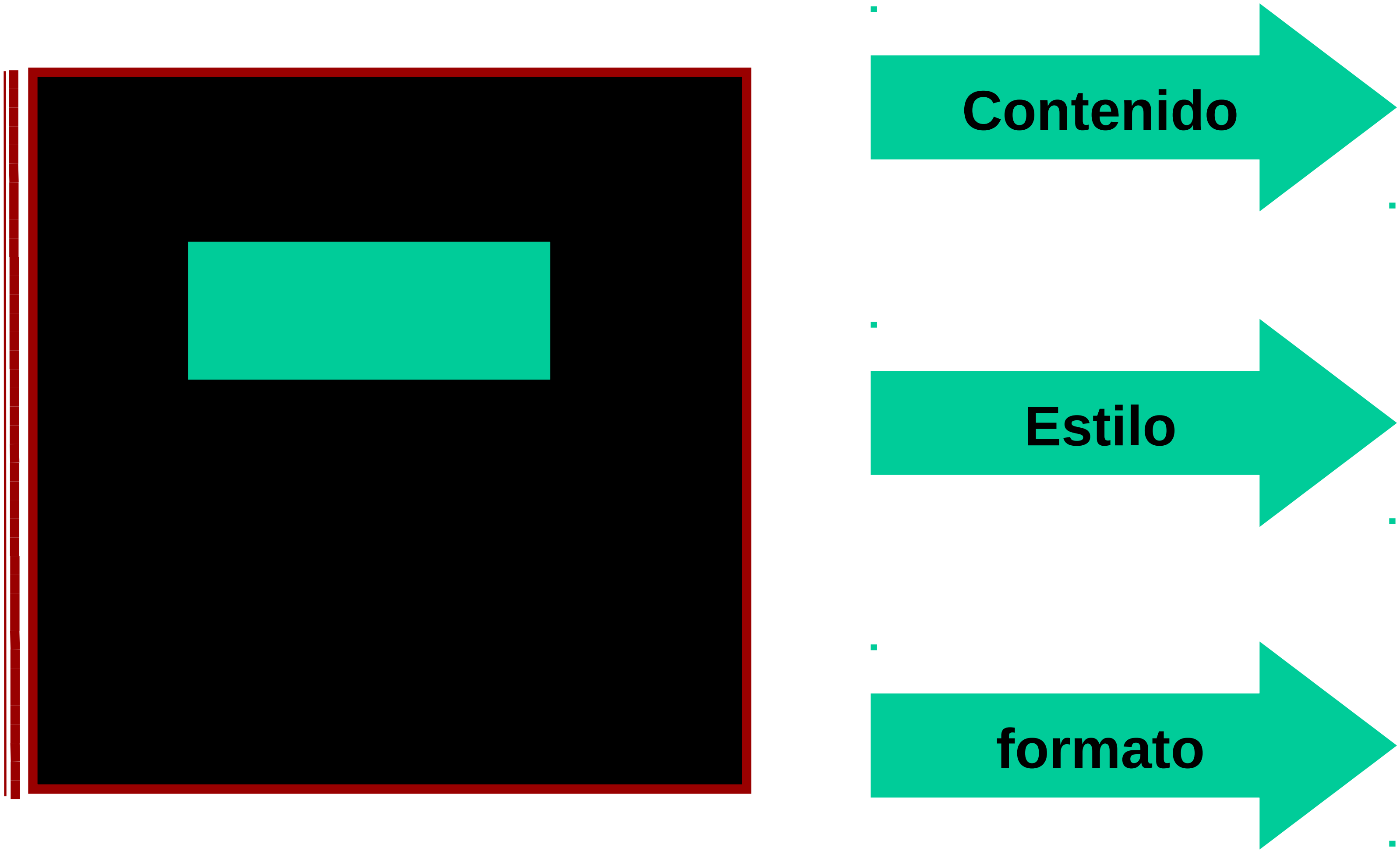
Ocasión

Objetivo

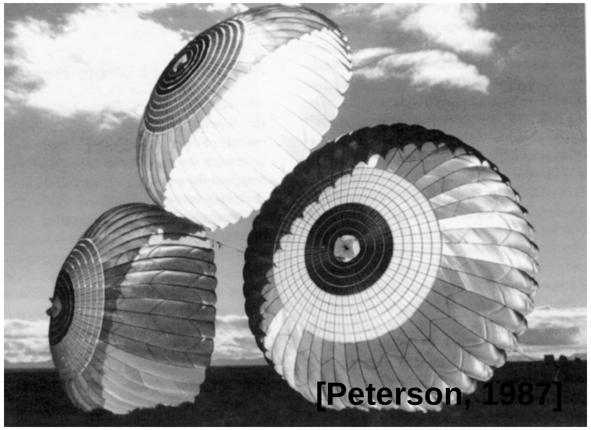
¿Informar?

¿Convencer?

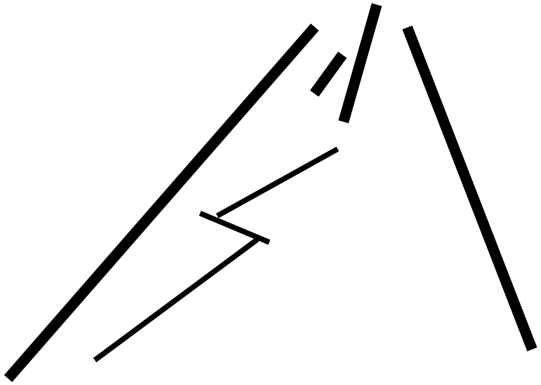
3 aspectos de la escritura que afectan a la forma en la que el lector evalúa el documento



Estilo : forma de comunicar el contenido a la audiencia



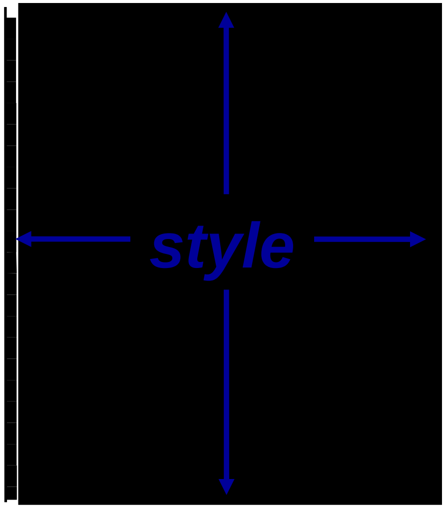
Ilustraciones



Estructura

Palabras
palabraspalabras
Palabraspalabraspalabras
palabraspalabraspalabraspalabras
wordswordswords
wordswordswords
wordswordswords
wordswordswords

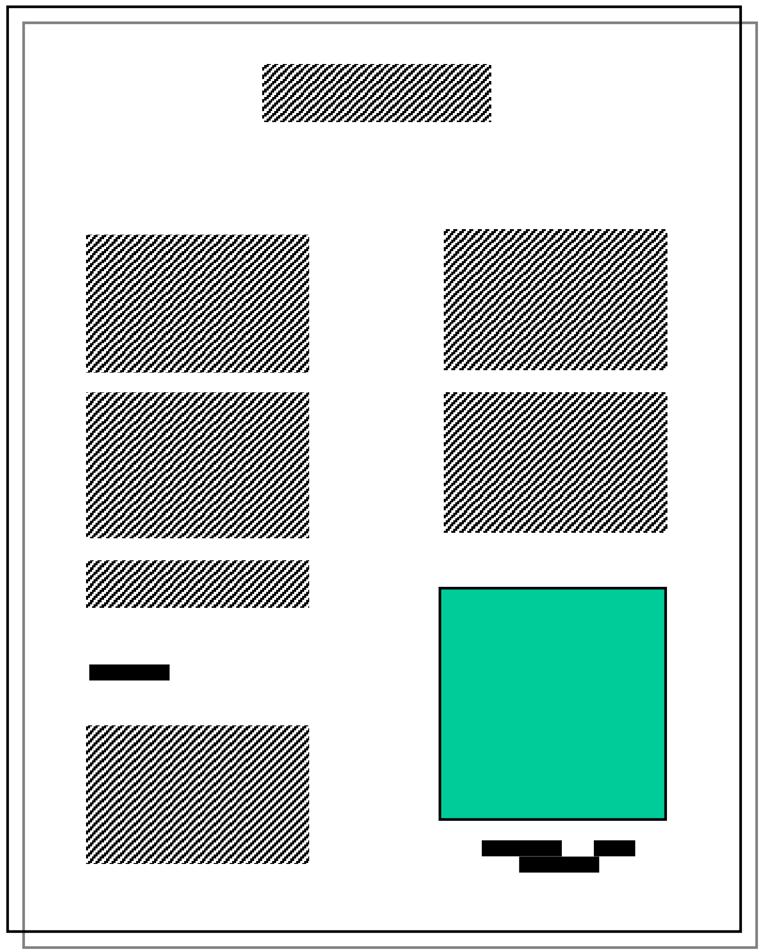
Lenguage



formato

tipografía

diseño



mecánica

gramática

tiempo verbal

puntuación

ortografía

Podemos dividir el proceso de escribir en

Entrar en sintonía con lo que te piden... reflexión...periodo de NO ESCRITURA

Escribir un borrador

Revisar, revisar, revisar

Terminar

ENTRAR EN SINTONIA ==> DECIDIR CONTENIDO

Antes de escribir un informe o un artículo
1- Analiza si tienes suficiente información para cerrar el documento

2. Organiza las figuras y las tablas que apoyarán al documento en orden

3. Organiza las ideas previas y las nuevas

Borrador

1. Haz el ejercicio de escribir un borrador con lo que tienes en la cabeza en base a las figuras y tablas que has considerado más relevantes

2. Que el borrador sea claro, no se quede con los detalles

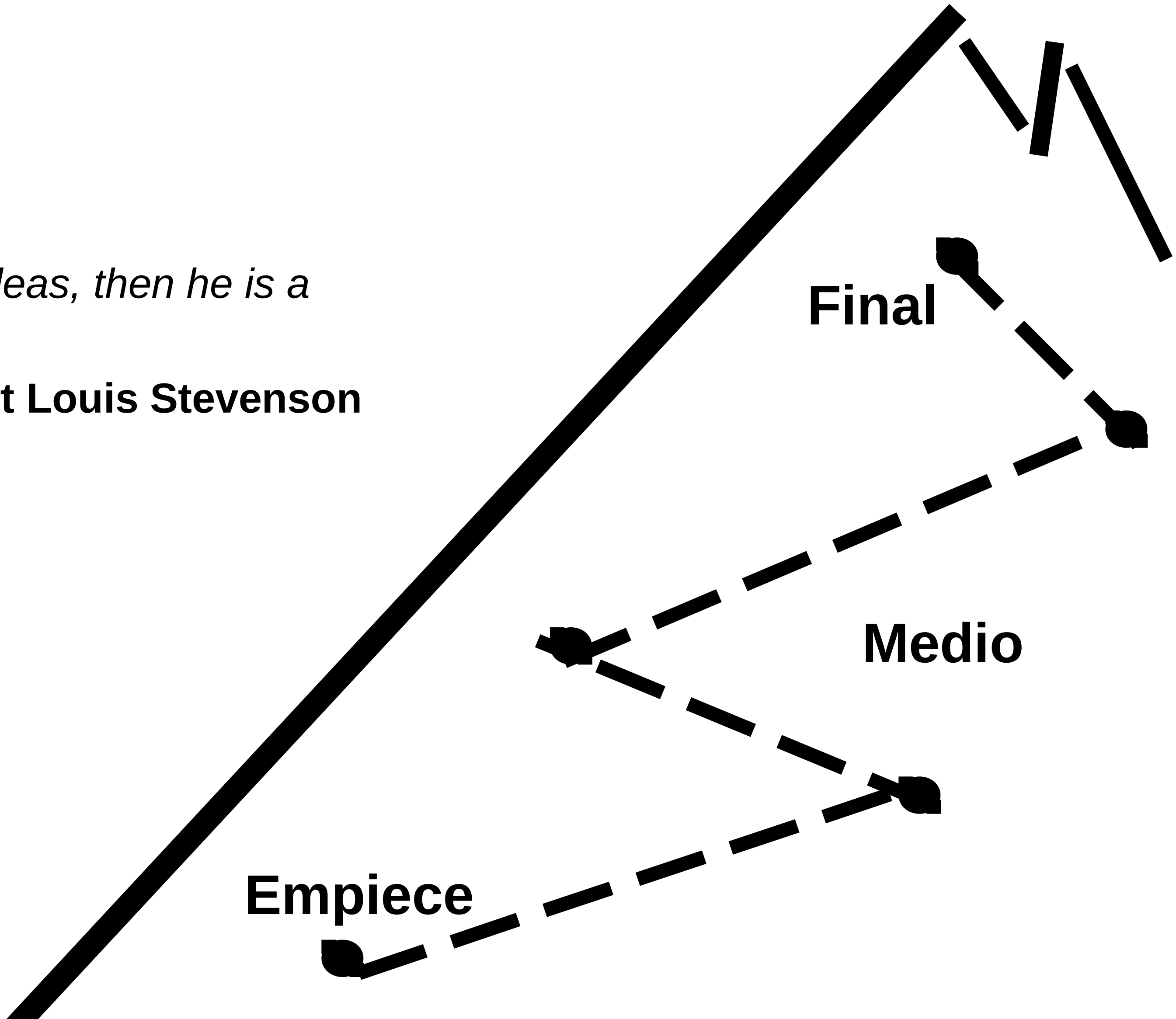
5. Mejóralo

6. Revisa formato

Estructura

If a man can group his ideas, then he is a writer.

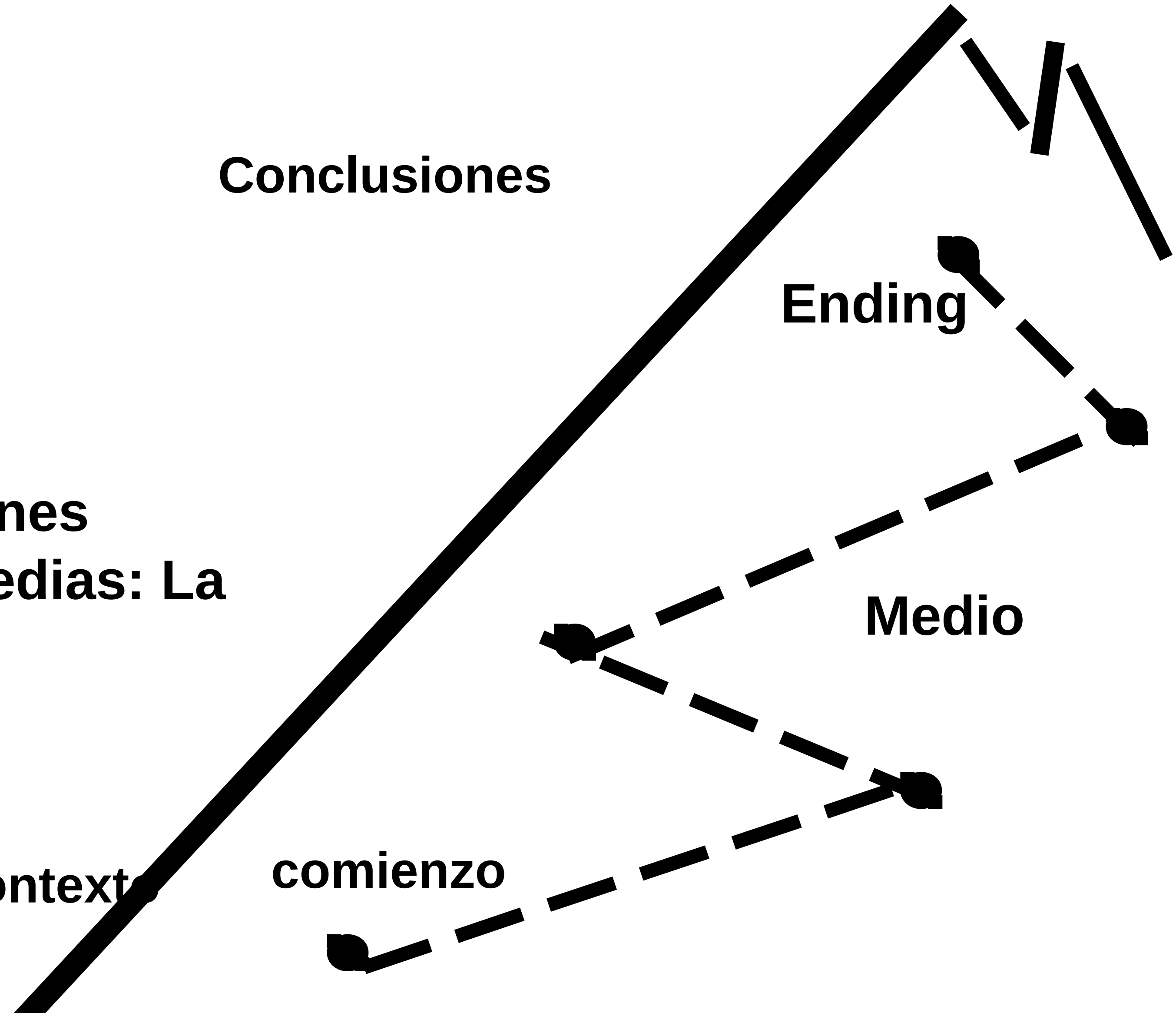
Robert Louis Stevenson



Organización

Conclusiones

Secciones intermedias: La trama



Título
Abstract
Introducción: el contexto

Comienzo:

Título Orienta al lector sobre el contenido

Abstract Le cuenta al lector lo que pasa

Introducción Prepara al lector para la trama

Comienzo

Un buen título ha de ser preciso y ha de separar tu trabajo del de otros

Effects of Humidity on the Growth of Avalanches

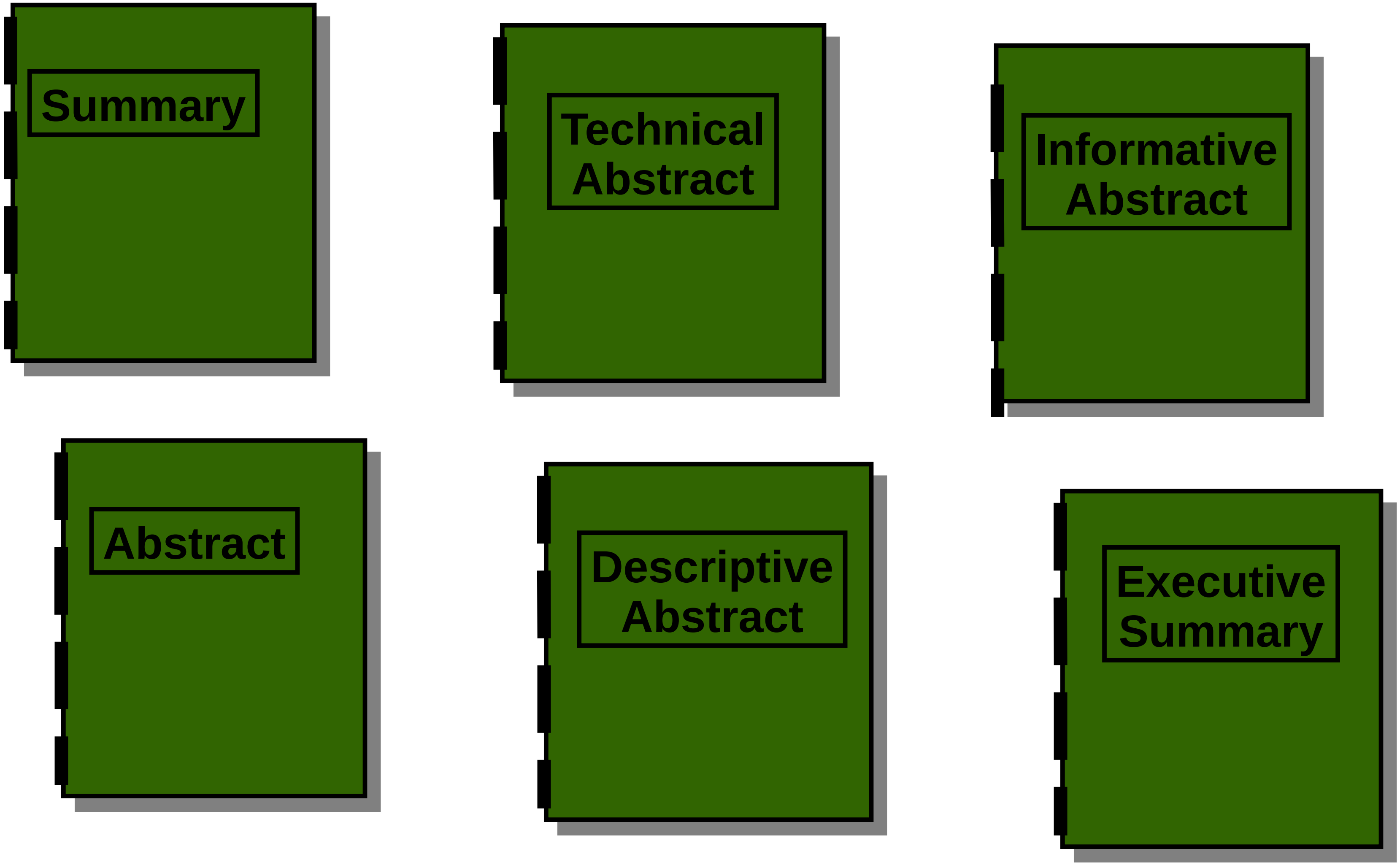
→

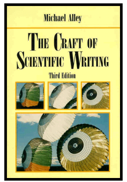
Effects of Humidity on the Growth of Electron Avalanches in Electrical Gas Discharges

Mal Título

Buen Título

Abstracts: se llaman también de otras formas





nature

How to construct a *Nature* summary paragraph

Recomendación sobre un buen abstract

Annotated example taken from *Nature* **435**, 114-118 (5 May 2005).

*One or two sentences providing a **basic introduction** to the field, comprehensible to a scientist in any discipline.*

*Two to three sentences of **more detailed background**, comprehensible to scientists in related disciplines.*

*One sentence clearly stating the **general problem** being addressed by this particular study.*

*One sentence summarising the main result (with the words "**here we show**" or their equivalent).*

*Two or three sentences explaining what the **main result** reveals in direct comparison to what was thought to be the case previously, or how the main result adds to previous knowledge.*

*One or two sentences to put the results into a more **general context**.*

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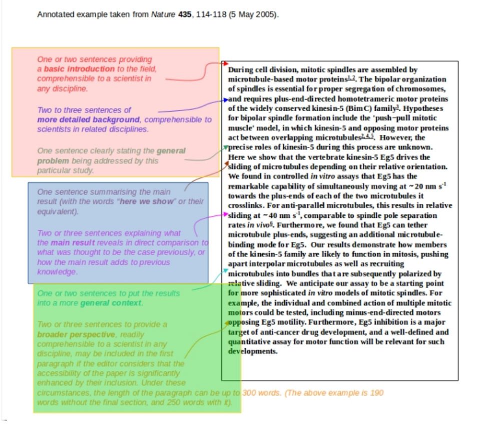
During cell division, mitotic spindles are assembled by microtubule-based motor proteins[1,2]. The bipolar organization of spindles is essential for proper segregation of chromosomes, and requires plus-end-directed homotetrameric motor proteins of the widely conserved kinesin-5 (BimC) family[3]. Hypotheses for bipolar spindle formation include the 'push–pull mitotic muscle' model, in which kinesin-5 and opposing motor proteins act between overlapping microtubules[2,4,5]. However, the precise roles of kinesin-5 during this process are unknown. Here we show that the vertebrate kinesin-5 Eg5 drives the sliding of microtubules depending on their relative orientation. We found in controlled *in vitro* assays that Eg5 has the remarkable capability of simultaneously moving at ~20 nm s^{-1} towards the plus-ends of each of the two microtubules it crosslinks. For anti-parallel microtubules, this results in relative sliding at ~40 nm s^{-1}, comparable to spindle pole separation rates *in vivo*[6]. Furthermore, we found that Eg5 can tether microtubule plus-ends, suggesting an additional microtubule-binding mode for Eg5. Our results demonstrate how members of the kinesin-5 family are likely to function in mitosis, pushing apart interpolar microtubules as well as recruiting microtubules into bundles that are subsequently polarized by relative sliding. We anticipate our assay to be a starting point for more sophisticated *in vitro* models of mitotic spindles. For example, the individual and combined action of multiple mitotic motors could be tested, including minus-end-directed motors opposing Eg5 motility. Furthermore, Eg5 inhibition is a major target of anti-cancer drug development, and a well-defined and quantitative assay for motor function will be relevant for such developments.

buen a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Parte introductoria del abstract

-introducción básica

-estado del arte más específico (trabajos mas recientes)

-problema a plantear (presentas el tema)

Ejemplo:

The El Niño-Southern Oscillation (ENSO) and the variability in the Pacific subtropical highs (PSHs) have major impacts on social and ecological systems.

Several studies have proposed the boreal summer equatorial atlantic sea surface temperature variability as main predictor of ENSO in recent decades.

Nevertheless the mechanisms acting on this relationship are not clear so far.

Parte media del abstract- Dos aproximaciones

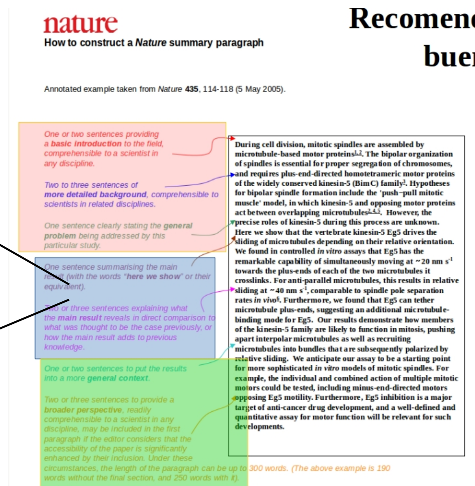
...Here we present an Atlantic capacitor effect mechanism to suggest that the Atlantic is a key pacemaker of the biennial variability in the Pacific including that in ENSO and the PSHs during recent decades. The ‘charging’ (that is, ENSO imprinting the North Tropical Atlantic (NTA) sea surface temperature (SST) via an atmospheric bridge mechanism) and ‘discharging’ (that is, the NTA SST triggering the following ENSO via a subtropical teleconnection mechanism) processes alternate, generating the biennial rhythmic changes in the Pacific.

Descriptivo

Here we present an Atlantic capacitor effect mechanism to suggest that the Atlantic is a key pacemaker of the biennial variability in the Pacific including that in ENSO and the PSHs during recent decades. By analysing the two-way regression maps of North Tropical Atlantic on the Pacific , a charging-‘discharging’ processes is found as the main mechanism tha generates the biennial rhythmic changes in the Pacific.

Recomendac

buen a



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Informativo

nature

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Esta parte saca la conclusión general y su repercusión

Un buen abstract organiza el documento:

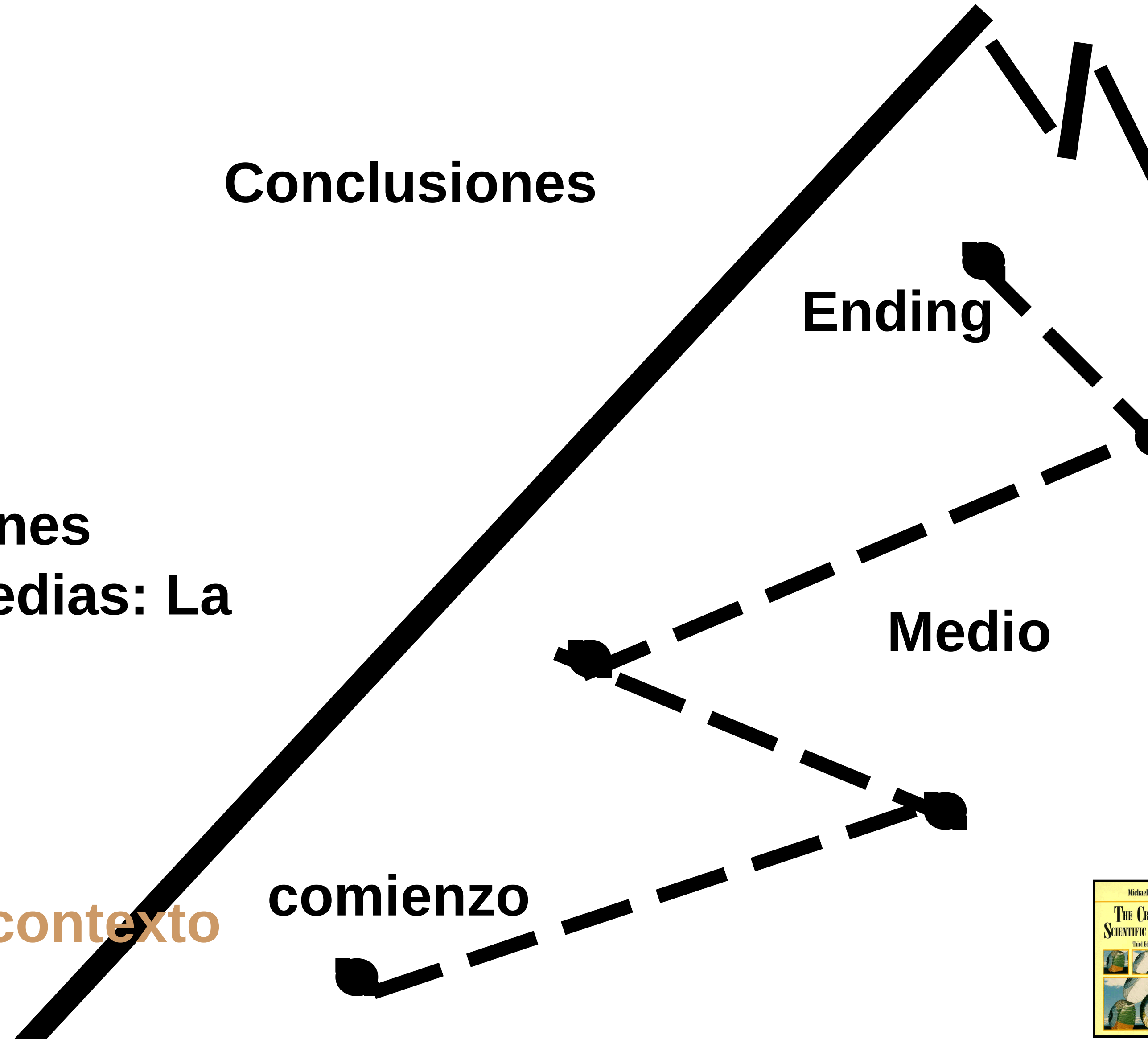
no empezar a escribir hasta tener una clara idea

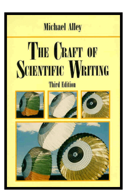
Organización

Conclusiones

Secciones intermedias: La trama

Título
Abstract
Introducción: el contexto





La introducción prepara al lector para la discusión

La introducción se suele escribir tras los resultados

Tema: de lo general a lo particular

Importancia del tema

Contexto y referencias

¿Que falta? ¿Que no se sabe?

La mayor parte de las referencias van en la introducción

Desarrollar en párrafos las frases de la intro del abstract

intro básica: presenta el tema general

-estado del arte más específico: focaliza más

-problema

La introducción define el objetivo y las limitaciones del estudio

La lluvia ocurre en una estacion determinada

Solo hay unos pocos trabajos

tema

Estudio de la precipitacion Anómala en Brasil

Que estudios se han hecho

-Como es la precipitación anomala
-a que se debe
-cuando ocurre

general

Los estudios disponibles abarcan pocos años

Ahora existen mejores datos

limitaciones

Al final de una buena introducción se le indica al lector POR QUE es importante el trabajo

This paper presents a design for a platinum catalytic igniter in hydrogen-air mixtures. This igniter has application in nuclear reactors. One danger at a nuclear reactor is a loss-of-coolant accident. Such an accident can produce large quantities of hydrogen gas when hot water and steam react with zirconium fuel rods. In a serious accident, the evolution of hydrogen may be so rapid that it produces an explosive hydrogen-air mixture in the reactor containment building. This mixture could breach the containment walls and allow radiation to escape.

Our method to eliminate this danger is to intentionally ignite the hydrogen-air mixture at concentrations below those for which any serious damage might result.

Resumen
¿Cómo hacer una buena introducción?

- Extendiendo las 3-4 primeras frases del abstract en 3-4 párrafos
- Referenciando adecuadamente el trabajo de otros
- Remarcando la necesidad del estudio
- Escribiendo manteniendo el **suspense (no cuentes el resultado)**
- Tiempo verbal: pasado para referencias, presente para el trabajo actual y su necesidad. Ser constante con los tiempos verbales.
- La introducción ha de llevar figuras ilustrativas

Los objetivos se pueden poner al final de la introducción

Organización

Conclusiones

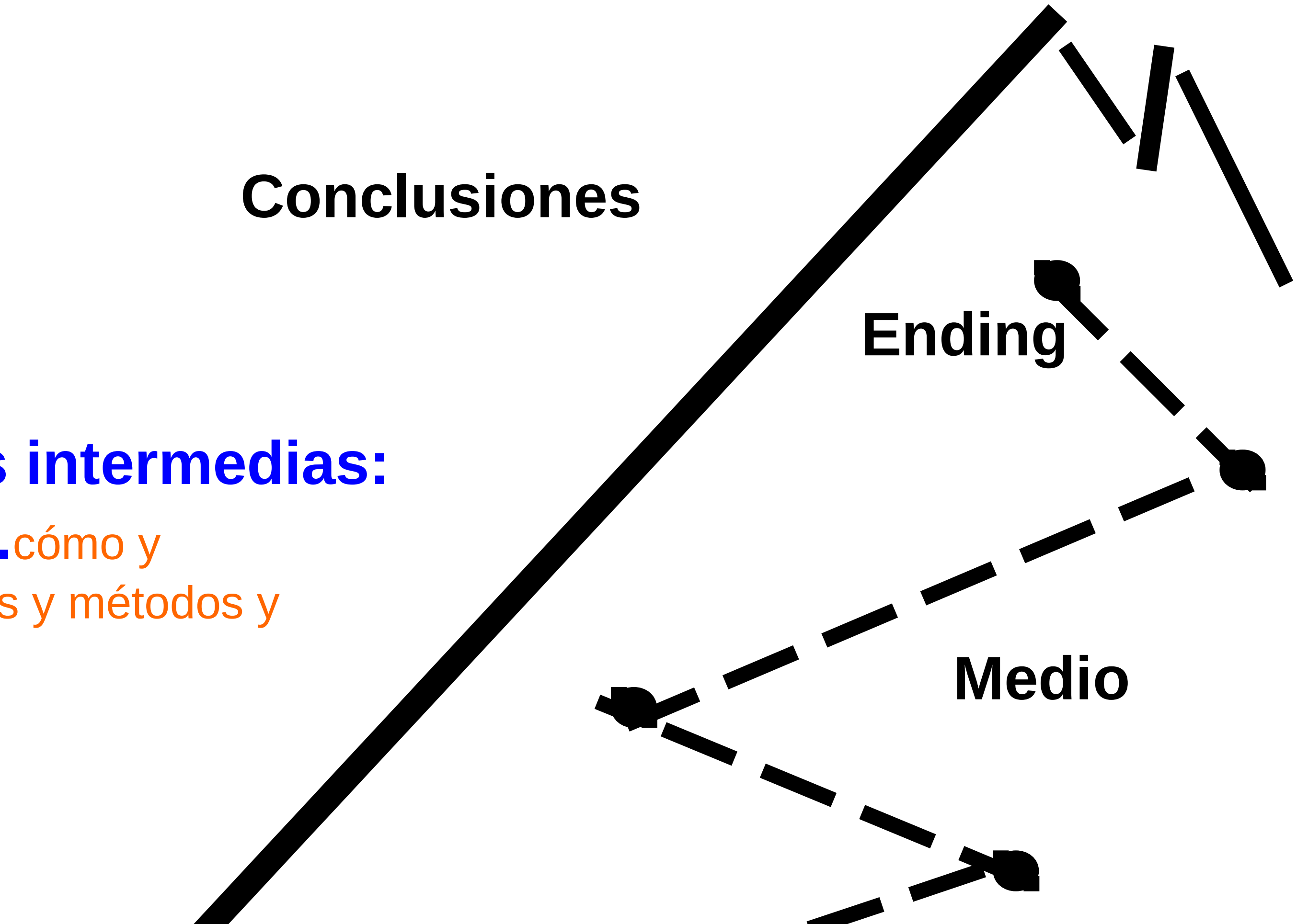
Secciones intermedias:

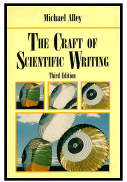
La trama...cómo y qué..materiales y métodos y resultados

Titulo

Abstract

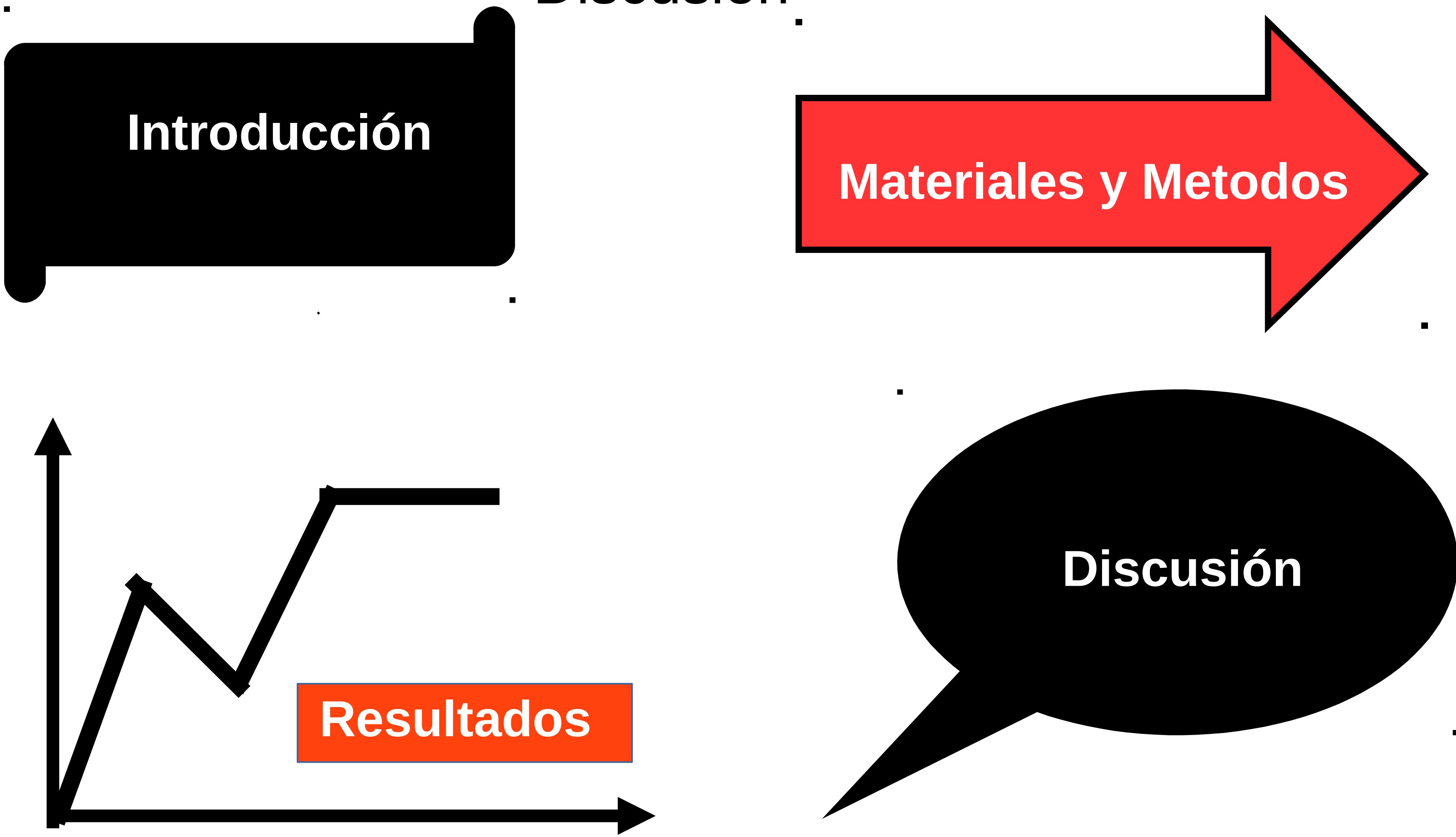
Introducción: el contexto





Muchas revistas siguen una forma común de organización IMRaD

Introduccion**, M**ateriales y **M**étodos**, R**esultados **y D**iscusion



Materiales y Métodos

- Haz referencia a las herramientas (datos, medidas de laboratorio, experimentos) y métodos de análisis empleados.

- La metodología es normalmente fácil de escribir porque es descriptiva.

- Ordena la metodologia de la misma forma en la que presentarías los resultados

Escribe materiales y métodos junto con los resultados

Secciones Intermedias: Resultados

Escribe materiales y métodos junto con los resultados

Haz secciones y subsecciones

Elige una estrategia

Heading
- **Subheading**
- **Subheading**

Heading
- **Subheading**
- **Subheading**
- **Subheading**

Heading

Cuando una sección se divide en subsecciones, todas las partes han de ser de la misma tarta

Influencia del océano en la lluvia

-Influencia Atlántica

-Influencia Mediterránea

-variabilidad interna (??)

??

La organización se oculta cuando los encabezados tienen lugar en una larga lista sin encabezados secundarios

Factores que alteran la lluvia

Forzamiento oceánico de la lluvia

-Influencia Atlántica

-Influencia Mediterránea

-Influencia Pacífica

Forzamiento interno de la lluvia

-Papel de los eddies tropicales

-Papel de los eddies extratropicales

Factores que alteran la lluvia

-Influencia Atlántica

-Influencia Mediterránea

-Influencia Pacífica

-Papel de los eddies tropicales

-Papel de los eddies extratropicale

Resultados

Ayuda: escribe
introducción tras
los resultados
para organizar
tus ideas

-Van acompañados de figuras y tablas

-son descriptivos pero no interpretativos

“Ejemplo1: These data show that something is higher/faster/larger than something else ($p<0.001$)”

“Ejemplo 2: Al aumentar x aumenta y”

- Describir no es volver a poner el pie de figura, la figura se menciona porque apoya la descripción

- Un error normal es añadir discusión e interpretación a esta sección

Esto no deja espacio para la sección de discusión

Importancia de Figuras y Tablas en Resultados

-Los conceptos nuevos fundamentales han de ir acompañados de figuras y/o tablas.
-los resultados han de apoyarse por figuras y tablas

-Las principales figuras de tu estudio van en la parte intermedia
-La descripción de las figuras y tablas va en el pie de figura y NO en el texto
-Describir las figuras en el texto resta agilidad a la lectura
-Referenciar en el pie de figura la fuente en el caso de usar figuras ajenas.

¿Como escribir?

The Elements of Style, **William Strunk Jr.** (disponible en: http://www.bartleby.com/141/):

"La escritura ha de ser concisa. Una frase no puede contener palabras innecesarias, un párrafo no puede contener frases innecesarias. Esto no obliga a que el escritor escriba TODAS las frases cortas o que evite los detalles, sino que tenga en cuenta que todo cuenta."

William Zinsser in *On Writing Well*, 1976 (no la traduzco por su interés)

The secret of good writing is to strip every sentence to its cleanest components. Every word that serves no function, every long word that could be a short word, every adverb that carries the same meaning that's already in the verb, every passive construction that leaves the reader unsure of who is doing what—these are the thousand and one adulterants that weaken the strength of a sentence. And they usually occur in proportion to the education and rank."

Texto

Usa frases cortas con conceptos simples,

Nunca escribas una frase con muchos conceptos.

Evita la subordinadas.

Preocúpate si tu frase ocupa 3 líneas.

Usa párrafos pequeños.

Evita los paréntesis para matizar.

Usa una buena gramática y puntuacion.

Si dudas, ve a lo fácil y simple.

CONSEJO: lee en alto lo que has escrito. Si no fluye, algo falla. Prueba a leer trozos cortos en lugar de largas secciones

El primer borrador que sea un resumen de todo

Importante: lo importante con el tiempo verbal es la consistencia

Tiempo verbal

Una buena forma de separar lo que uno ha hecho de lo que otros han realizado es mezclar los tiempos verbales, usando cada uno para una cosa y no mezclando en una misma cosa

Esto es normal en la parte de discusión

Ejemplo:

> The protein ***was*** non-functional after modification of the terminal residue. This result ***is*** consistent with those from other groups (references) and ***indicates***….

Discusión

Un buen final, Analizas los resultados y das perspectivas futuras

Tras la introducción se suele escribir la discusión, que interpreta los resultados y los coloca en el contexto de la literatura disponible.

Conclusiones

Análisis de Resultados

Analizar los resultados de una forma global

Perspectivas Futuras

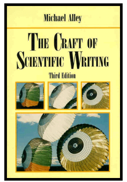
Opciones:

Hacer recomendaciones
Discutir trabajo futuro
Repetir las limitaciones

Uso de Apéndices para proporcionar mas informacion a otras audiencias

Apendice A
Concern About the Greenhouse Effect

For almost a hundred years, experts have been concerned with the increasing concentrations of gases such as carbon dioxide, methane, and nitrogen oxides in the earth's lower atmosphere. These gases are natural by-products of combustion. Figure A-1 illustrates the correlation between global temperature and carbon dioxide concentrations...



Uso de apéndices para proporcionar información tangencias a lectores primarios

Apendice B
Project Stormfury

In 1961, the United States Weather Bureau and the Department of Defense (Navy) began a project to reduce the strength of hurricanes. The project, called Project Stormfury, uses cloud seeding, a process used to produce rainfall and reduce hail in thunderstorms. In Project Stormfury, silver iodide crystals, similar in structure to ice, are dispersed by airplanes in the upper reaches of cloud formations just outside the hurricane's eye where the winds are highest. Initial results showed that wind speeds decreased between 15–30% after seedings...

Uso de glosario de términos para definir términos no familiares

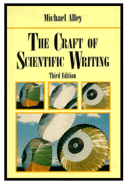
Glosario

burst point: **the exact point in space where an atomic bomb is detonated.**

clear visibility: **a viewing range of twenty miles.**

fallout: **the descent to the Earth's surface of radioactive particles from a cloud contaminated with the fission products of a nuclear explosion.**

hypocenter: **the point on the earth's surface directly below the burst point; also called ground zero.**

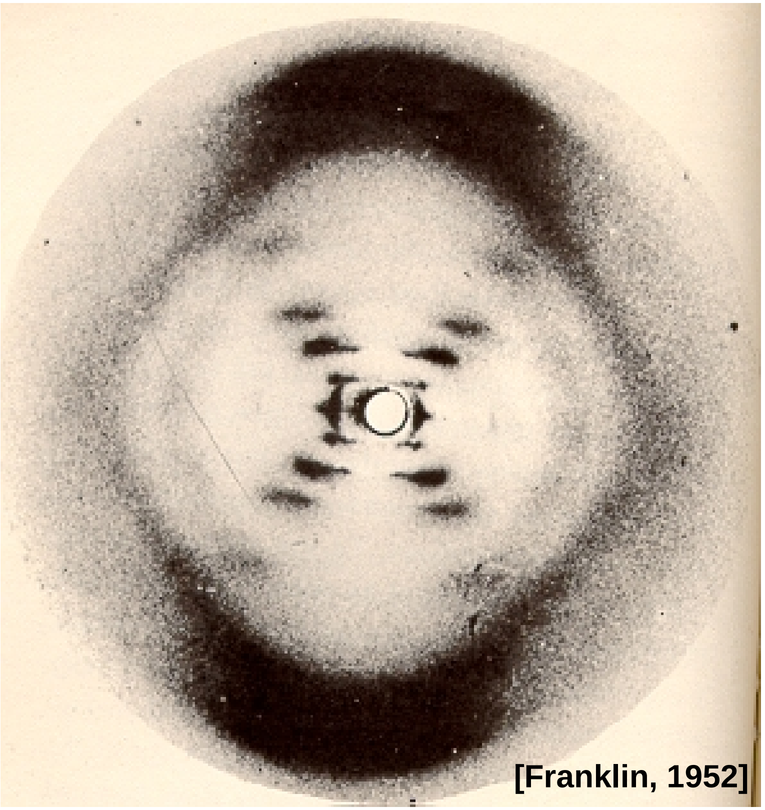


Uso de lista de Acrónimos

ECMWF: European Center for Medium Range Weather Forecast
GHGs: Green House Gases
GW: Global Warming
SST: Sea surface temperature

Referencias

Hay que citar la contribución de otra gente
Hay que demostrar que se está bien documentado.



James Watson surreptitiously looked at Rosalind Franklin's work

Watson did not give enough credit to Franklin

James Watson, quien con Francis Crick fueron los descubridores del DNA, fue acusada de omitir la contribución of Rosalind Franklin, cuya fotografía del DNA fue usada por Watson

Referencias

¿qué referencias?
Evita páginas webs que no sean oficiales
Apóyate en trabajos científicos publicados en libros, artículos, informes oficiales.

¿cuando usar referencias?
Cuando introduzcas el tema y el estado del arte.
Cuando definas las bases de datos y la metodología
Cuando discutas los resultados en el contexto del tema.

¿cómo buscar referencias?
Google Scholar
Mendeley
BibTex
EndNote

Formato: Cómo escribir

Belen Rodríguez de Fonseca

(parte II del Taller de Escritura)

Antes de escribir un informe o un

1- Analiza si tienes suficiente información para cerrar el documento

2. Organiza las figuras y las tablas que apoyaran al documento en orden

3. Organiza las ideas previas y las nuevas

4. Escribe un borrador con lo que tienes en la cabeza y las figuras y tablas

5. Mejóralo

6. revisa formato

Title
Abstract
Introduction
Methodology
Results
Discussion
References

Figure/Tables legends

En un artículo científico lo normal es una estructura de este estilo

- **Formato**: Cómo escribir

Procesadores

- LaTeX: Mac, Linux, Windows

(http://nokyotsu.com/latex/osx.html)

(exiten editores o puedes escribir directamente visualizando el codigo fuente

Word (existen plantillas para escribir trabajos)

https://templates.office.com/en-us/templates-for-Word

- Open Office (software libre)
- Libre Office (software libre…con mas futuro!!)

Las revistas científicas ofrecen sus plantillas

“Instructions to authors”

- Muchas revistas o informes dan instrucciones
- En general:

Lee las instrucciones generales a cumplir antes de escribir

Todas las revistas tienen un estilo
Ejemplo:

The BMJ insists all papers are written in first person I demonstrated that….

Las revistas MAS CIENTÍFICAS tienden a requerir la tercera persona o impersonal

These data demonstrate that….

Se ha demostrado como los datos...

Figuras

-Las figuras se numeran
Se nombran en el texto como **Figura x .**
Cuando van entre paréntesis, muchas veces van abreviadas
Ejemplo:
Figure 1 shows an increase of temperature with height
An increase of temperature with height is observed (Fig.1)

-Con un número Figure 1, Fig.1
-**Con 2**: uno relativo a la sección y otro a la numeración dentro de la sección. Figure 3.4 , Fig 3.4

Pies de figura (Figure captions)

Descripción de la figura
Descripción de la variable que se representa
Unidades de la variable
Asociación con colores o isolíneas
Fuente en caso de figura ajena
El pie de figura ha de contener la información necesaria para su autonomía

-Caso de dos figuras iguales pero para diferentes variables

Indicar que es igual y matizar la diferencia: “Idem que en Figura x pero para la temperatura”

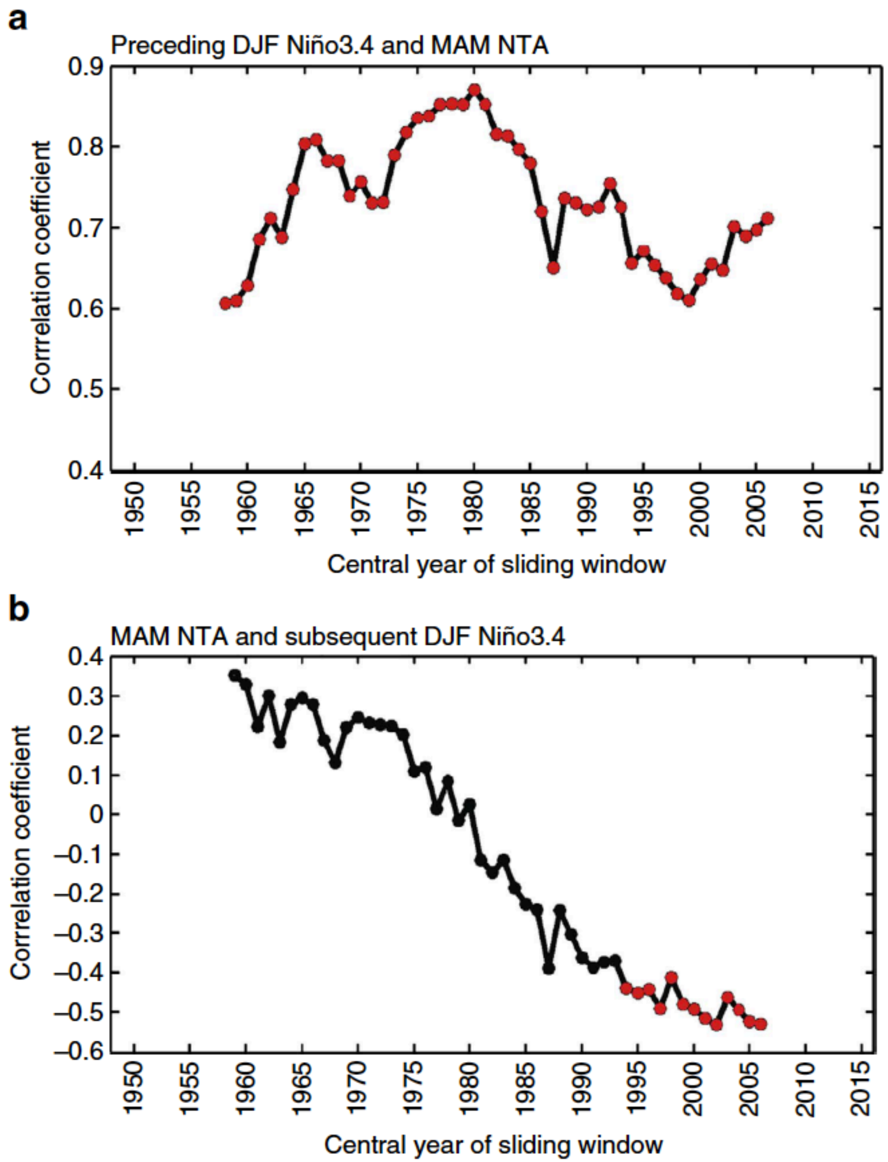


Figure 1 | Correlations between the ENSO and NTA SST indices. (**a**) The 21-year sliding correlation coefficients (for example, correlation coefficient in 2002 representing 1992–2012) between preceding boreal winter (DJF) Niño3.4 and spring (MAM) NTA SST during 1948–2016. (**b**) Same as **a** but for MAM NTA SST and subsequent DJF Niño3.4. Following ref. 20, the impact of the previous winter ENSO has been excluded in **b** by removing the linear regression with respect to the Niño3.4 index during the previous DJF season. The linear trend has been removed within each sliding window for both indices before calculating the sliding correlation coefficients. The red dots represent correlations that are significant at the 95% confidence level.

LOS PIES DE FIGURA TIENEN QUE SER MUY PRECISOS Y EXPLICAR TODO LO QUE SE VE

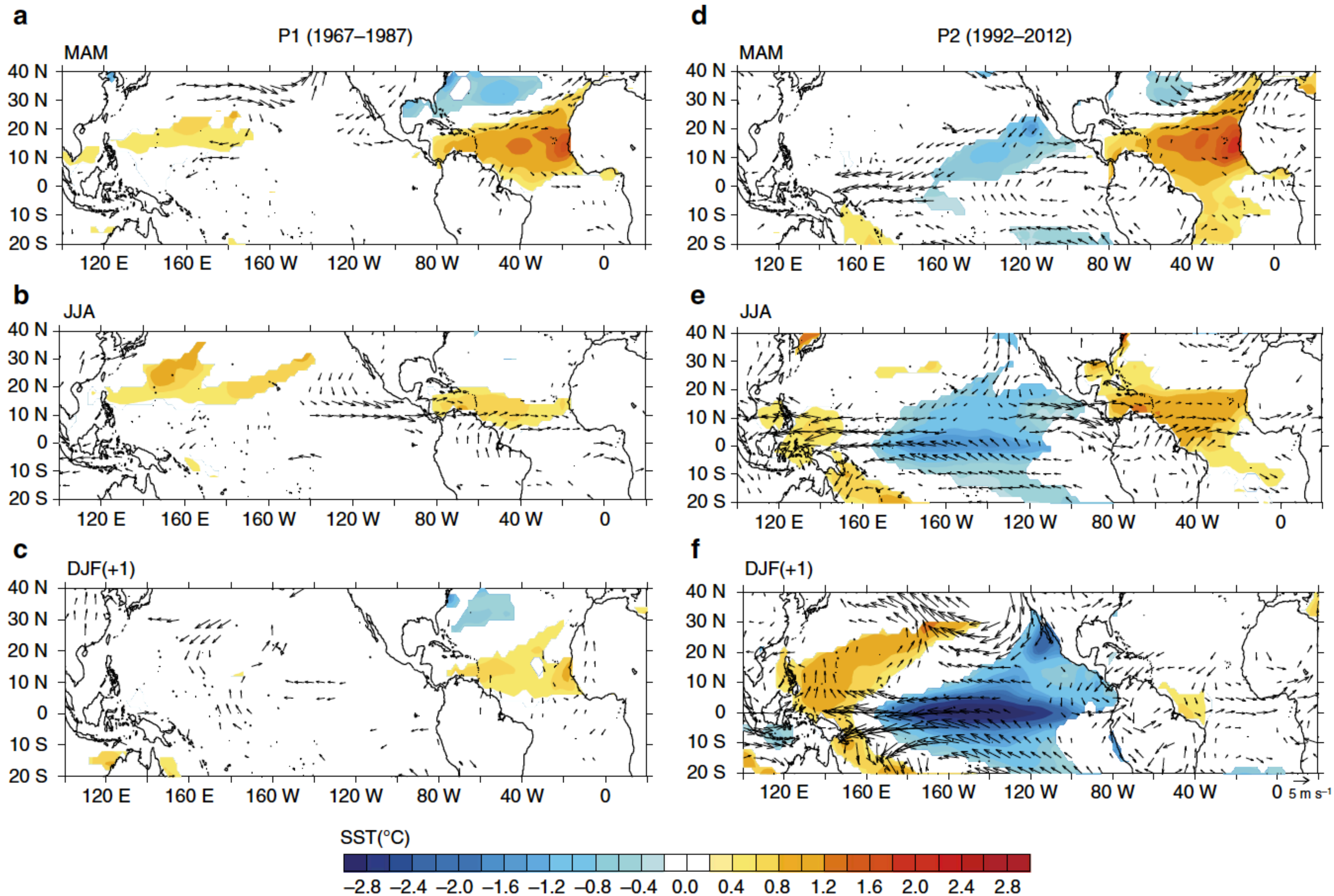


Figure 3 | Regression with respect to spring NTA SST. (**a**–**c**) Regressions of SSTAs (shading) and 850-hPa winds (vector) with respect to the MAM NTA SST during P1 for MAM (**a**), JJA (**b**) and DJF (**c**) seasons. (**d**–**f**) Same as **a**–**c** but for during P2 for MAM (**d**), JJA (**e**) and DJF (**f**) seasons. The impact of the previous winter ENSO has been excluded by removing the linear regression with respect to the Niño3.4 index during the previous DJF season. Only the values at the 90% confidence level or higher are shown.

¿cómo ha de ser una buena figura?

Tiene que ilustrar el concepto que acompaña al párrafo que la describe.

Puede estar formada por diferentes tipos de gráficas, pero en asociación. Simple en colores y formas. No muy recargadas

Todo lo que se muestra se tiene que poder ver.

Imprímela primero o ponla en el tamaño del documento final en la pantalla para comprobar si se ven.

(cuidado con etiquetas de los ejes, ticks, valores en los contornos en mapas de isolineas, etc..)

¿cómo resumir en 5 figuras mi trabajo?

-No se muestran TODAS las figuras que uno ha realizado sino el resumen de las mismas

Es bueno hacer figuras resumen

Ejemplo:

En lugar de poner un conjunto de mapas donde lo único que cambia es la localización de un máximo, haz una gráfica donde se ve el valor del máximo en el eje de ordenadas y la localización de dicho máximo en el eje x.

-Cada párrafo va asociado a la descripción de una figura. La figura ha de representar un resultado. Intenta agrupar tus resultados en 3 o 4 conceptos y, para cada uno, busca una figura.

Tablas

-Las tablas se numeran
Se nombran en el texto con un sólo número (Tabla 1)
O Con 2 números: uno relativo a la sección y otro a la numeración dentro de la sección (Tabla 2.1).
-Pie de tabla
Descripcion de la tabla por filas y columnas
Descripción de la variable que se representa
Unidades de la variable
Significado de subrayados o alteraciones
Procedencia en caso de tabla ajena
El pie de tabla ha de contener la información necesaria para su autonomía
-Caso de dos tablas iguales con una ligera diferencia
Indicar que es igual y matizar la diferencia: “Idem que en Tabla x pero para ...”

sphere (TOA). Table 1 shows the model names, modeling centers, and whether the AMIP simulations are available. Further information on individual models is available online (at http://www-pcmdi.llnl.gov/; Taylor et al. 2012). Here, we only use one ensemble member ("r1i1p1") run for each model.

TABLE 1. A list of the 18 CMIP5 climate models used in this study and the labels to denote them in the figures and text.

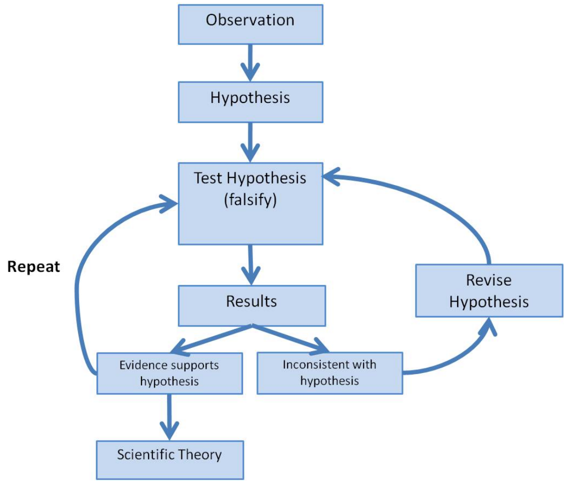
Model name (label)	Model expanded name	Model group (or center)	Including AMIP simulations?
CanESM2 (M1)	Second Generation Canadian Earth System Model	Canadian Centre for Climate Modelling and Analysis (CCCma)	No
CCSM4 (M2)	Community Climate System Model, version 4	NCAR	No
CNRM-CM5 (M3)	Centre National de Recherches Météorologiques Coupled Global Climate Model, version 5	Centre National de Recherches Météorologiques (CNRM)/Centre Européen de Recherche et de Formation Avancée en Calcul Scientifique (CERFACS)	Yes
CSIRO Mk3.6.0 (M4)	Commonwealth Scientific and Industrial Research Organisation Mark, version 3.6.0	Commonwealth Scientific and Industrial Research Organisation (CSIRO)/Queensland Climate Change Centre of Excellence (QCCCE)	Yes
FGOALS-s2 (M5)	Flexible Global Ocean–Atmosphere–Land System Model, second spectral version	Institute of Atmospheric Physics (IAP)	Yes
GFDL-ESM2G (M6)	Geophysical Fluid Dynamics Laboratory Earth System Model with Generalized Ocean Layer Dynamics (GOLD) component	NOAA/Geophysical Fluid Dynamics Laboratory (GFDL)	No
GFDL-ESM2M (M7)	Geophysical Fluid Dynamics	NOAA/GFDL	No

Figuras esquemáticas

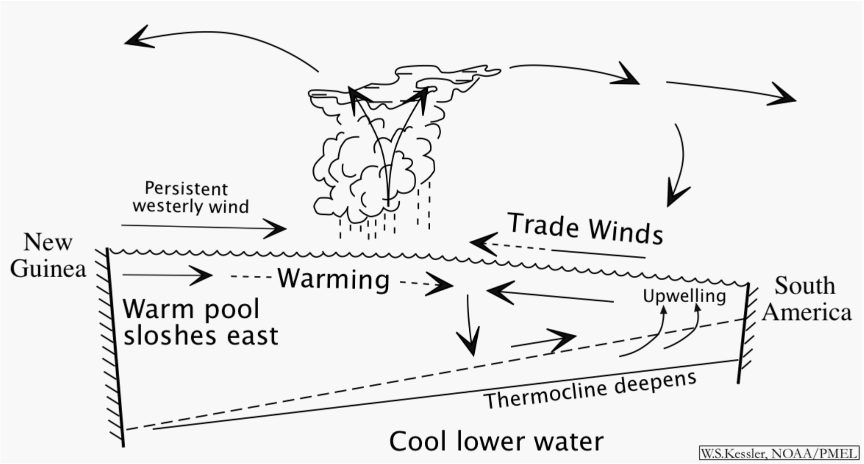
-sirven para resumir una idea

-**ejemplo**:

Resumen metodológico



Resumen de un mecanismo



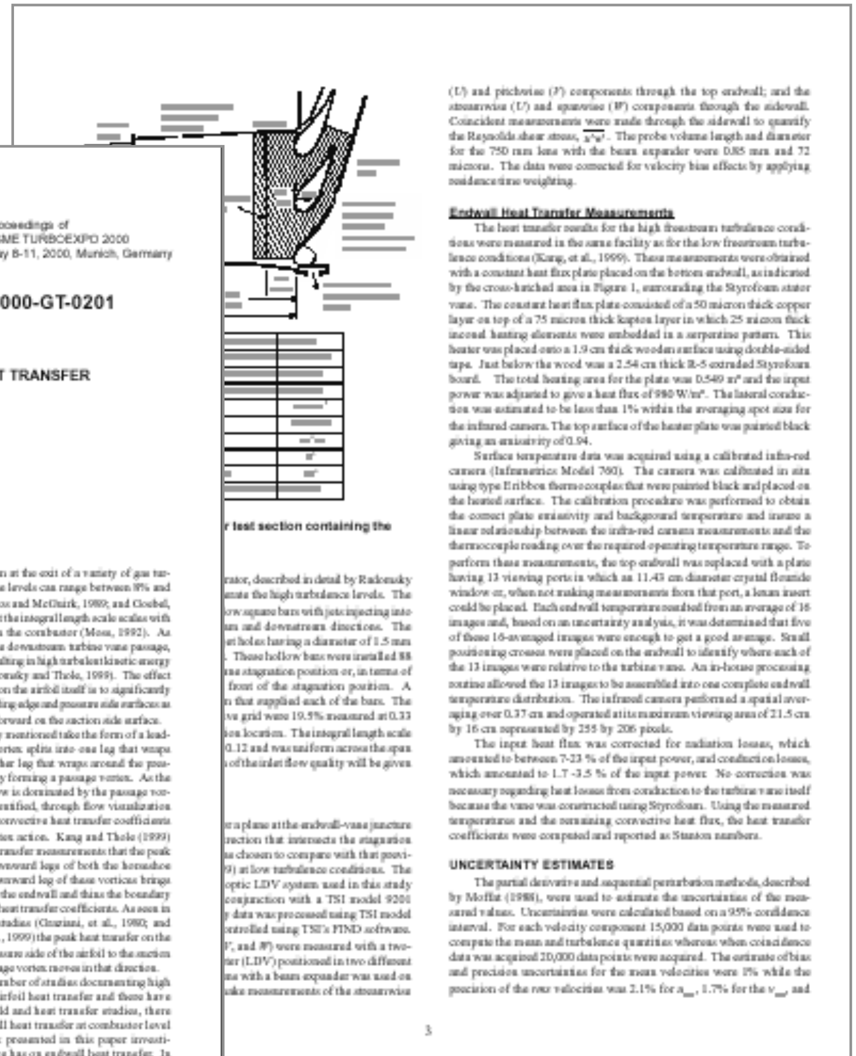
Ecuaciones

-Se numeran a un lado (normalmente el derecho) de la ecuación

Es parte del texto, por lo que no llevan pie, pero, a continuación, se suele explicar las variables que aparecen en la misma.

Cuando se mencionan, ya se pone la numeración

Formato de Documentos Científicos



(U) and pitchwise (V) components through the top endwall; and the streamwise (U) and spanwise (W) components through the sidewall.

Endwall Heat Transfer Measurements

UNCERTAINTY ESTIMATES

3

Proceedings of
ASME TURBOEXPO 2000
May 8-11, 2000, Munich, Germany

2000-GT-0201

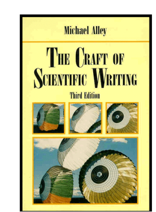
HIGH FREESTREAM TURBULENCE EFFECTS ON ENDWALL HEAT TRANSFER
FOR A GAS TURBINE STATOR VANE

R.W. Radomsky* and K. A. Thole
Mechanical Engineering Department
Virginia Polytechnic Institute and State University
Blacksburg, Virginia 24060

ABSTRACT

INTRODUCTION

1



En escritura ceintífica el formato varía considerablemente para servir a diferentes situaciones

Simulations using probabilistic distributions often represent a more realistic model in a number of situations, since producing and assembling parts to exactly the same dimension every time is not possible. An excellent example of statistical variation is found in gas turbine manufacturing where no manufactured part or clearance is ever at the *exact* nominal dimensions specified in the design. There is always a tolerance around the nominal value that results from the variation that is inherent to any manufacturing process. For a number of years, a wide range of industries have been using statistical models to control the quality of their product. More recently, industries have begun to formalize their statistical quality control, and have been putting forth a great deal of time and money to educate employees on the use of statistical methods. "Six Sigma" is an example of this formalization of statistical control, and is now in the forefront of many corporate training agendas.

Also presented with this work are methods to determine which level of reliability is most cost effective for an engine manufacturer. The cost-tolerance models used in this research are simple and intended to illustrate qualitative trends only. Lastly, the analysis methods presented in this work will be shown to be the foundation for future work that involves predicting the performance reliability of engines over time.

1.2 Approach

The approach used to conduct this research was modular in nature, with each successive step building upon the previous step. As such, this document is organized in a manner to walk the reader through each step in detail. This section gives a brief overview of each step that will later be discussed in more detail.

The first stage in being able to predict the performance reliability of an engine is simply being able to predict the performance of the engine with single point nominal inputs. Performance prediction models are common in aero-engine manufacturing industries and often provide very accurate predictions of engine performance. For variability-analysis methods such as those presented in this research, accurate

2

Informe

Proceedings of
ASME TURBOEXPO 2000
May 8-11, 2000, Munich, Germany

2000-GT-0201

HIGH FREESTREAM TURBULENCE EFFECTS ON ENDWALL HEAT TRANSFER FOR A GAS TURBINE STATOR VANE

R.W. Radomsky* and K.A. Thole
Mechanical Engineering Department
Virginia Polytechnic Institute and State University
Blacksburg, Virginia 24060

ABSTRACT

High freestream turbulence along a gas turbine airfoil and strong secondary flows along the endwall have both been reported to significantly increase convective heat transfer. This study superimposes high freestream turbulence on the naturally occurring secondary flow vortices to determine the effects on the flowfield and the endwall convective heat transfer. Measured flowfield and heat transfer data were compared between low freestream turbulence levels (0.6%) and combustor simulated turbulence levels (19.5%) that were generated using an active grid. These experiments were conducted using a scaled-up, first stage stator vane geometry. Infrared thermography was used to measure surface temperatures on a constant heat flux plate placed on the endwall surface. Laser Doppler velocimeter (LDV) measurements were performed of all three components of the mean and fluctuating velocities of the leading edge horseshoe vortex. The results indicate that the mean flowfields for the leading edge horseshoe vortex were similar between the low and high freestream turbulence cases. High turbulence levels in the leading edge-endwall juncture were attributed to a vortex unsteadiness for both the low and high freestream turbulence cases. While, in general, the high freestream turbulence increased the endwall heat transfer, low augmentations were found to coincide with the regions having the most intense vortex motions.

INTRODUCTION

Along a turbine airfoil surface, elevated convective heat transfer coefficients occur as a result of high turbulence levels exiting a combustor in a gas turbine engine. The platform of an airfoil (endwall), a critical surface where durability can be an issue, also has high convective heat transfer levels with a complex footprint. The complexity occurs from the secondary flows that develop in the form of vortices that sweep the platform surface. Both of these effects, high freestream turbulence effects on airfoil heat transfer and secondary flow effects on endwall heat transfer, have been discussed in the literature. What is missing from the literature is the combined effects of combustor level freestream turbulence and secondary flows on endwall heat transfer.

Turbulence measurements taken at the exit of a variety of gas turbine combustors have shown that the levels can range between 8% and 40% (Goldstein, et al., 1983; Kuotmos and McGuirk, 1989; and Goebel, et al., 1993) with some indication that the integral length scale scales with the diameter of the dilution holes in the combustor (Moss, 1992). As these high levels progress through the downstream turbine vane passage, there is a production of turbulence resulting in high turbulent kinetic energy levels at the exit of the passage (Radomsky and Thole, 1999). The effect that these high turbulence levels has on the airfoil itself is to significantly increase the heat transfer along the leading edge and pressure side surfaces as well as move the transition location forward on the suction side surface.

The secondary flows previously mentioned take the form of a leading edge horseshoe vortex. This vortex splits into one leg that wraps around the suction surface and another leg that wraps around the pressure surface with the latter ultimately forming a passage vortex. As the flow progresses downstream, the flow is dominated by the passage vortex. Gaugler and Russell (1984) identified, through flow visualization and surface heat transfer, that high convective heat transfer coefficients coincided with the most intense vortex action. Kang and Thole (1999) showed through flowfield and heat transfer measurements that the peak heat transfer coincided with the downward legs of both the horseshoe vortex and passage vortex. The downward leg of these vortices brings high speed freestream fluid towards the endwall and thins the boundary layer to ultimately increase the local heat transfer coefficients. As seen in several past endwall heat transfer studies (Graziani, et al., 1980; and Boyle and Russell, 1990; Kang, et al., 1999) the peak heat transfer on the passage endwall sweeps from the pressure side of the airfoil to the suction side of the adjacent airfoil as the passage vortex moves in that direction.

Although there have been a number of studies documenting high freestream turbulence effects on airfoil heat transfer and there have been a number of endwall flowfield and heat transfer studies, there are no studies documenting endwall heat transfer at combustor level freestream turbulence. The work presented in this paper investigates the effect that high turbulence has on endwall heat transfer. In particular, one of the regions having the highest heat transfer is the leading edge-endwall juncture. Three-dimensional flowfield mea-

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East Hartford, CT 06108

1

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Artículo para una revista

No todas las reglas de formato son constantes

Informe Sandia Laboratories	Libro de Texto Prentice-Hall	Artículo ASME
Figure 1	Fig. 1	fig. 1
Table 1	Table 1	table 1
equation 1	equation (1)	Eq. 1

Formato es el modo de presentación de un escrito

tipografía

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2000-GT-0201

HIGH FREESTREAM TURBULENCE EFFECTS ON ENDWALL HEAT TRANSFER FOR A GAS TURBINE STATOR VANE

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ABSTRACT

High freestream turbulence along a gas turbine airfoil and strong secondary flows along the endwall have both been reported to significantly increase convective heat transfer. This study superimposes high freestream turbulence on the naturally occurring secondary flow vortices to determine the effects on the flowfield and the endwall convective heat transfer. Measured flowfield and heat transfer data were compared between low freestream turbulence levels (0.6%) and combustor simulated turbulence levels (19.5%) that were generated using an active grid. These experiments were conducted using a scaled-up, first stage stator vane geometry. Infrared thermography was used to measure surface temperatures on a constant heat flux plate placed on the endwall surface. Laser Doppler velocimeter (LDV) measurements were performed of all three components of the mean and fluctuating velocities of the leading edge horseshoe vortex. The results indicate that the mean flowfields for the leading edge horseshoe vortex were similar between the low and high freestream turbulence cases. High turbulence levels in the leading edge-endwall juncture were attributed to a vortex unsteadiness for both the low and high freestream tubulence cases. While, in general, the high freestream turbulence increased the endwall heat transfer, low augmentations were found to coincide with the regions having the most intense vortex motions.

INTRODUCTION

Along a turbine airfoil surface, elevated convective heat transfer coefficients occur as a result of high turbulence levels exiting a combustor in a gas turbine engine. The platform of an airfoil (endwall), a critical surface where durability can be an issue, also has high convective heat transfer levels with a complex footprint. The complexity occurs from the secondary flows that develop in the form of vortices that sweep the platform surface. Both of these effects, high freestream turbulence effects on airfoil heat transfer and secondary flow effects on endwall heat transfer, have been discussed in the literature. What is missing from the literature is the combined effects of combustor level freestream turbulence and secondary flows on endwall heat transfer.

Turbulence measurements taken at the exit of a variety of gas turbine combustors have shown that the levels can range between 8% and 40% (Goldstein, et al., 1983; Kuotmos and McGuirk, 1989; and Goebel, et al., 1993) with some indication that the integral length scale scales with the diameter of the dilution holes in the combustor (Moss, 1992). As these high levels progress through the downstream turbine vane passage, there is a production of turbulence resulting in high turbulent kinetic energy levels at the exit of the passage (Radomsky and Thole, 1999). The effect that these high turbulence levels has on the airfoil itself is to significantly increase the heat transfer along the leading edge and pressure side surfaces as well as move the transition location forward on the suction side surface.

The secondary flows previously mentioned take the form of a leading edge horseshoe vortex. This vortex splits into one leg that wraps around the suction surface and another leg that wraps around the pressure surface with the latter ultimately forming a passage vortex. As the flow progresses downstream, the flow is dominated by the passage vortex. Graziani and Russell (1984) identified, through flow visualization and surface heat transfer, that high convective heat transfer coefficients coincided with the most intense vortex action. Kang and Thole (1999) showed through flowfield and heat transfer measurements that the peak heat transfer coincided with the downward legs of both the horseshoe vortex and passage vortex. The downward leg of these vortices brings high speed freestream fluid towards the endwall and thins the boundary layer to ultimately increase the local heat transfer coefficients. As seen in several past endwall heat transfer studies (Graziani, et al., 1980; and Boyle and Russell, 1990; Kang, et al., 1999) the peak heat transfer on the passage endwall sweeps from the pressure side of the airfoil to the suction side of the adjacent airfoil as the passage vortex moves in that direction.

Although there have been a number of studies documenting high freestream turbulence effects on airfoil heat transfer and there have been a number of endwall flowfield and heat transfer studies, there are no studies documenting endwall heat transfer at combustor level freestream turbulence. The work presented in this paper investigates the effect that high turbulence has on endwall heat transfer. In particular, one of the regions having the highest heat transfer is the leading edge-endwall juncture. Three-dimensional flowfield mea-

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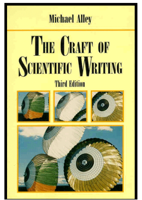

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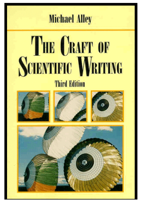

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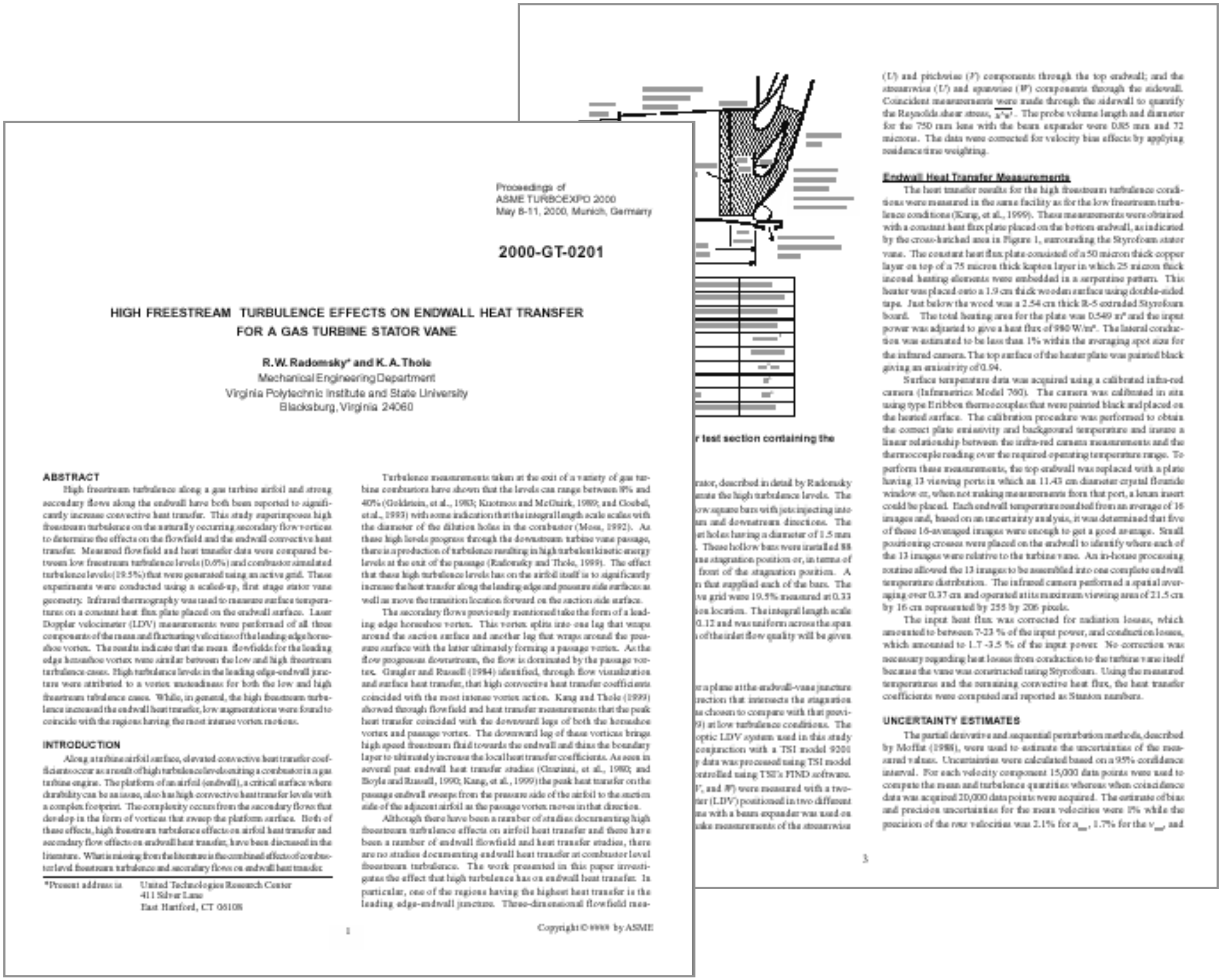
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Endwall Heat Transfer Measurements

UNCERTAINTY ESTIMATES

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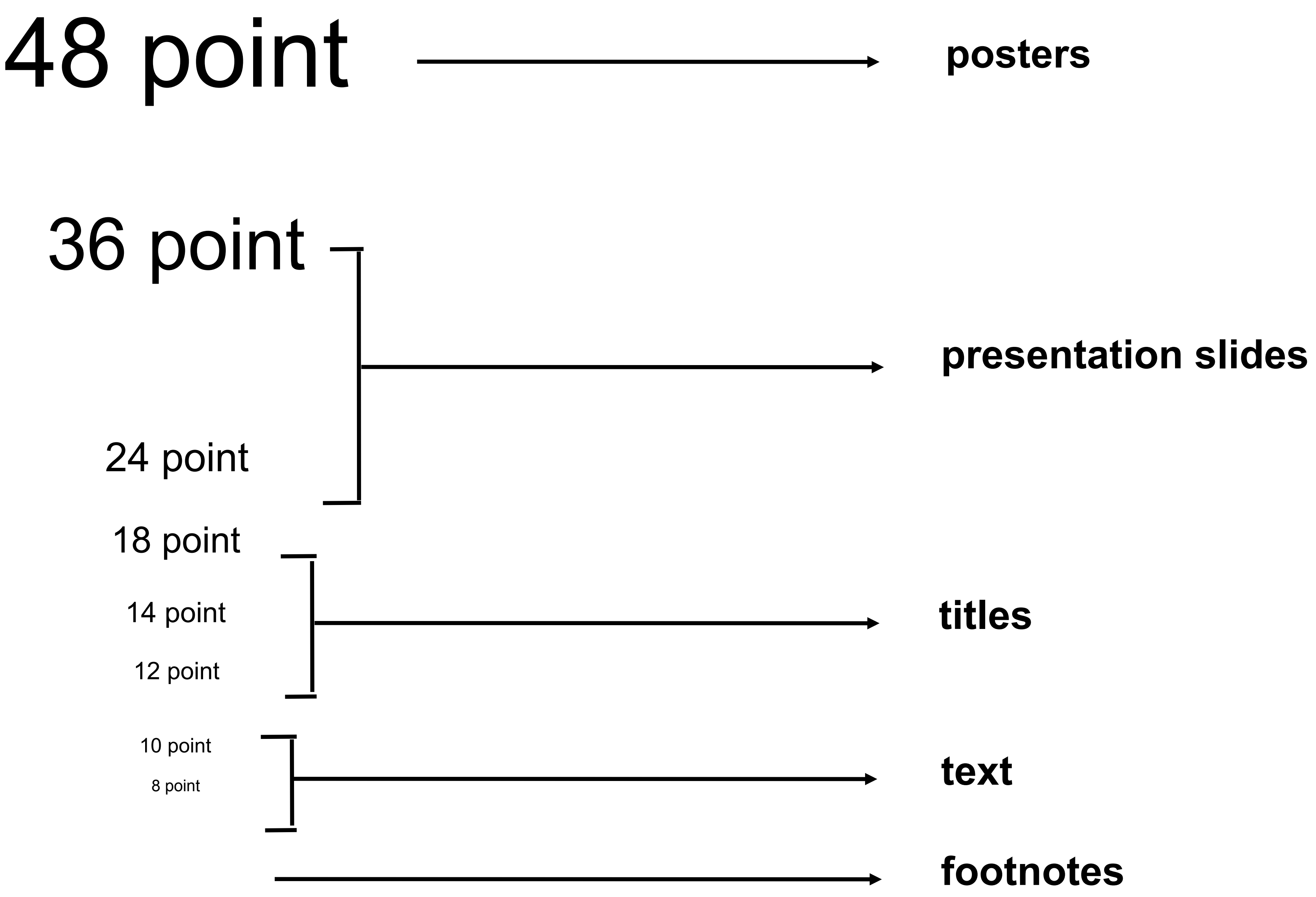

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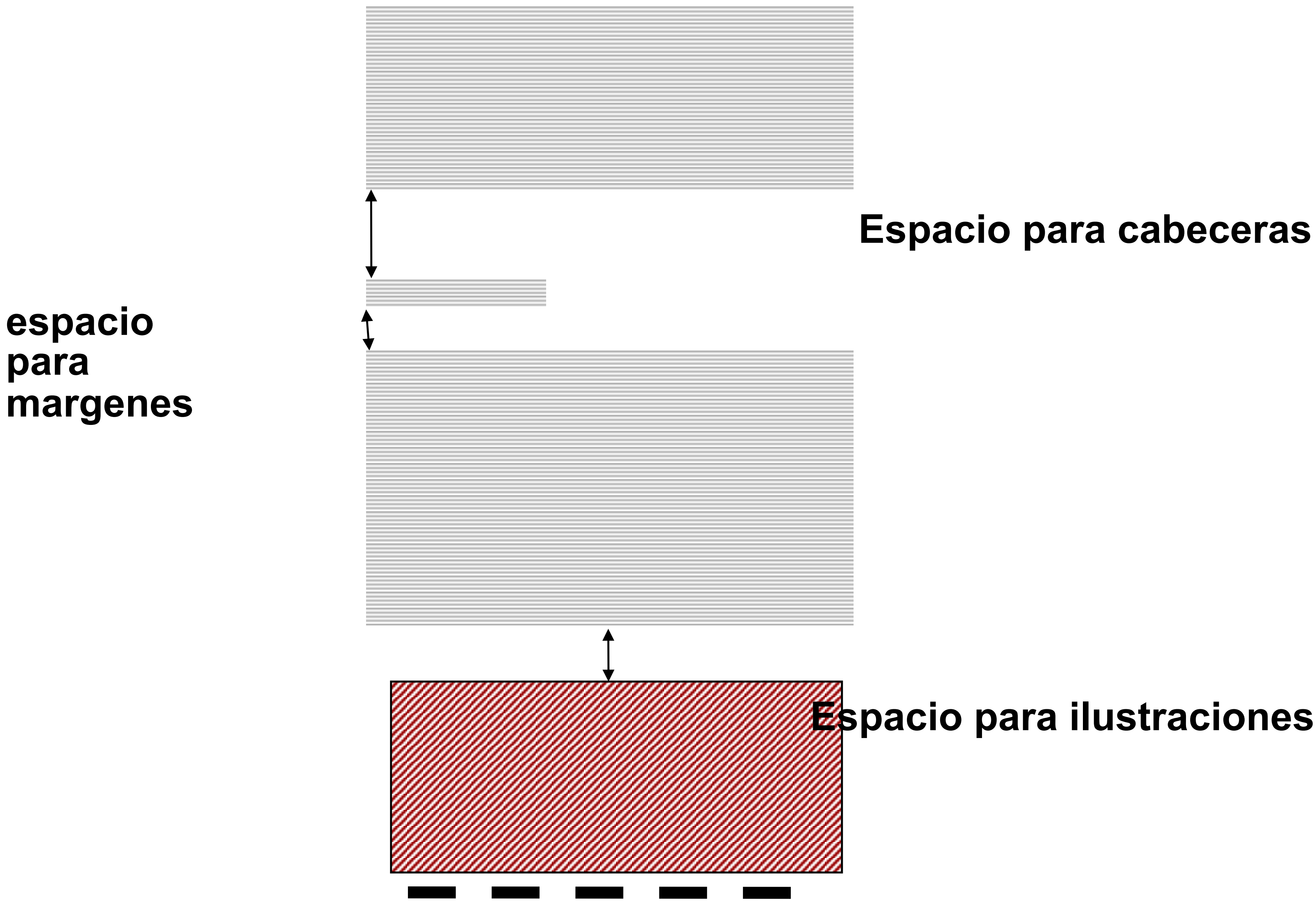

Referencias

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- Si todo el contenido de una sección se ha sacado de un libro, indicarlo en un pie de página.
- Para resultados o conceptos concretos, integrarlo en el cuerpo del texto.

“Frank et al (2015) encontraron como las oscilaciones decadales..”

Cómo:

- Un Autor Autor(año). Ejemplo Smith (2001)
- Dos autores Autor1 and Autor2 (año) Ejemplo: Smith and Ropeleski (2010)
- Mas de dos autores Autor1 et al (año). Ejemplo: Smith et al (2010)

EJEMPLO 1: numérico

The El Niño-Southern Oscillation (ENSO) and Pacific subtropical highs (PSHs) affect the livelihoods of people worldwide through their influences on severe natural hazards including tropical storms, coastal erosion, droughts and floods[1–3].

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EJEMPLO 2: nombre

Several classification methods of circulation weather types have been developed, and are currently used in a wide range of applications (Huth et al., 2008, 2010; Philipp et al., 2010). In addition, in 2002, Sheridan stated that the "Synoptic weather-typing, or the classification of weather conditions or patterns into categories, continues to be popular, and numerous methods have been developed over the past century" (Sheridan, 2002). The increasing interdisciplinary use of circulation weather types in Europe became clear when the European project "Harmonization and Applications of Weather Types Classifications for European Regions—COST733," where a wide range of classification schemes for different spatial domains were developed and compared within the scope of distinct applications. (Huth et al., 2008, 2010; Philipp et al., 2010).

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