

Advances in Photosynthesis and Respiration 38  
Including Bioenergy and Related Processes

Davide Zannoni  
Roberto De Philippis *Editors*

# Microbial BioEnergy: Hydrogen Production

 Springer

# Microbial Bioenergy Hydrogen Production Advances In Photosynthesis And Respiration

**Paul Hudson**



## **Microbial Bioenergy Hydrogen Production Advances In Photosynthesis And Respiration:**

*Microbial BioEnergy: Hydrogen Production* Davide Zannoni, Roberto De Philippis, 2014-07-08 The central theme of this book *Microbial BioEnergy Hydrogen Production* is focused on the biological machinery that microorganisms use to produce hydrogen gas The book summarizes the achievements over the past decade in the biochemistry structural and molecular biology genomics and applied aspects of microbial H<sub>2</sub> production including microbial fuel cells MFC by phototrophs such as purple sulfur and non sulfur bacteria *Thiocapsa* spp *Rhodobacter* and *Rhodospseudomonas* spp microalgae *Chlamydomonas* and cyanobacteria *Anabaena* spp along with anaerobes and thermophiles such as *Caldicellulosiruptor* and *Thermotoga* This is the first book of this series entirely devoted to microbial bio hydrogen production and is intended to be a precious source of information for PhD students researchers and undergraduates from disciplines such as microbiology biochemistry biotechnology photochemistry and chemical engineering interested in basic and applied sciences [Green Energy to Sustainability: Strategies for Global Industries](#) Alain A. Vertes, Nasib Qureshi, Hans P. Blaschek, Hideaki Yukawa, 2020-03-25 Reviews the latest advances in biofuel manufacturing technologies and discusses the deployment of other renewable energy for transportation Aimed at providing an interface useful to business and scientific managers this book focuses on the key challenges that still impede the realization of the billion ton renewable fuels vision It places great emphasis on a global view of the topic reviewing deployment and green energy technology in different countries across Africa Asia South America the EU and the USA It also integrates scientific technological and business development perspectives to highlight the key developments that are necessary for the global replacement of fossil fuels with green energy solutions *Green Energy to Sustainability Strategies for Global Industries* examines the most recent developments in biofuel manufacturing technologies in light of business financial value chain and supply chain concerns It also covers the use of other renewable energy sources like solar energy for transportation and proposes a view of the challenges over the next two to five decades and how these will deeply modify the industrial world in the third millennium The coming of age of electric vehicles is also looked at as is the impact of their deployment on the biomass to biofuels value chain Offers extensive updates on the field of green energy for global industries Covers the structure of the energy business chemicals and diesel from biomass ethanol and butanol hydrogen and methane and more Provides an expanded focus on the next generation of energy technologies Reviews the latest advances in biofuel manufacturing technologies Integrates scientific technological and business perspectives Highlights important developments needed for replacing fossil fuels with green energy *Green Energy to Sustainability Strategies for Global Industries* will appeal to academic researchers working on the production of fuels from renewable feedstocks and those working in green and sustainable chemistry and chemical process engineering It is also an excellent textbook for courses in bioprocessing technology renewable resources green energy and sustainable chemistry

*Comprehensive Biotechnology*, 2019-07-17 *Comprehensive Biotechnology Third Edition Six Volume Set* unifies in a single

source a huge amount of information in this growing field The book covers scientific fundamentals along with engineering considerations and applications in industry agriculture medicine the environment and socio economics including the related government regulatory overviews This new edition builds on the solid basis provided by previous editions incorporating all recent advances in the field since the second edition was published in 2011 Offers researchers a one stop shop for information on the subject of biotechnology Provides in depth treatment of relevant topics from recognized authorities including the contributions of a Nobel laureate Presents the perspective of researchers in different fields such as biochemistry agriculture engineering biomedicine and environmental science

**Cyanobacteria Biotechnology** Paul Hudson, 2021-04-20 Unites a biological and a biotechnological perspective on cyanobacteria and includes the industrial aspects and applications of cyanobacteria Cyanobacteria Biotechnology offers a guide to the interesting and useful features of cyanobacteria metabolism that keeps true to a biotechnology vision In one volume the book brings together both biology and biotechnology to illuminate the core aspects and principles of cyanobacteria metabolism Designed to offer a practical approach to the metabolic engineering of cyanobacteria the book contains relevant examples of how this metabolic module is currently being engineered and how it could be engineered in the future The author includes information on the requirements and real world experiences of the industrial applications of cyanobacteria This important book Brings together biology and biotechnology in order to gain insight into the industrial relevant topic of cyanobacteria Introduces the key aspects of the metabolism of cyanobacteria Presents a grounded practical approach to the metabolic engineering of cyanobacteria Offers an analysis of the requirements and experiences for industrial cyanobacteria Provides a framework for readers to design their own processes Written for biotechnologists microbiologists biologists biochemists Cyanobacteria Biotechnology provides a systematic and clear volume that brings together the biological and biotechnological perspective on cyanobacteria

**Anaerobes in Biotechnology** Rajni Hatti-Kaul, Gashaw Mamo, Bo Mattiasson, 2016-11-21 This book review series presents current trends in modern biotechnology The aim is to cover all aspects of this interdisciplinary technology where knowledge methods and expertise are required from chemistry biochemistry microbiology genetics chemical engineering and computer science Volumes are organized topically and provide a comprehensive discussion of developments in the respective field over the past 3 5 years The series also discusses new discoveries and applications Special volumes are dedicated to selected topics which focus on new biotechnological products and new processes for their synthesis and purification In general special volumes are edited by well known guest editors The series editor and publisher will however always be pleased to receive suggestions and supplementary information Manuscripts are accepted in English

**Sustainable Hydrogen Production** Ibrahim Dincer, Calin Zamfirescu, 2016-08-05 Sustainable Hydrogen Production provides readers with an introduction to the processes and technologies used in major hydrogen production methods This book serves as a unique source for information on advanced hydrogen generation systems and applications including

integrated systems hybrid systems and multigeneration systems with hydrogen production Advanced and clean technologies are linked to environmental impact issues and methods for sustainable development are thoroughly discussed With Earth's fast growing populations we face the challenge of rapidly rising energy needs To balance these we must explore more sustainable methods of energy production Hydrogen is one key sustainable method because of its versatility It is a constituent of a large palette of essential materials chemicals and fuels It is a source of power and a source of heat Because of this versatility the demand for hydrogen is sure to increase as we aim to explore more sustainable methods of energy Furthermore Sustainable Hydrogen Production provides methodologies models and analysis techniques to help achieve better use of resources efficiency cost effectiveness and sustainability The book is intellectually rich and interesting as well as practical The fundamental methods of hydrogen production are categorized based on type of energy source electrical thermal photonic and biochemical Where appropriate historical context is introduced Thermodynamic concepts illustrative examples and case studies are used to solve concrete power engineering problems Addresses the fundamentals of hydrogen production using electrical thermal photonic and biochemical energies Presents new models methods and parameters for performance assessment Provides historical background where appropriate Outlines key connections between hydrogen production methods and environmental impact sustainable development Provides illustrative examples case studies and study problems within each chapter

Solar Water Splitting Valiollah Mirkhani, Mahmood Tavakoli Hafshejani, Mahmoud Nasrollahzadeh, Mehrnaz Bahadori, 2025-02-15 Solar Water Splitting PV Electrolysis Photoelectrochemical Photothermal Photocatalyst and Photobiological Methods is a fundamental resource offering detailed information on PV electrolysis photoelectrochemical photothermal photocatalyst photobiological and other innovative methods for the production of hydrogen gas as well as presenting the theory design and materials involved This is supported by application examples and recent developments in areas such as tandem cells dye sensitized photoelectrochemical cells and perovskite cells for solar water splitting This book will be of interest to researchers scientists and advanced students across solar energy renewable energy chemistry chemical engineering nanotechnology and materials science as well as engineers and industrial personnel with an interest in water splitting solar cells and hydrogen production Introduces the theory design and materials of solar water splitting Provides in depth coverage of a range of processes and applications Reviews current progress and considers future opportunities

Second and Third Generation of Feedstocks Angelo Basile, Francesco Dalena, 2019-03-23 Second and Third Generation of Feedstocks The Evolution of Biofuels presents a critical analysis of both the applications and potential of bioenergy production from second and third generation feedstocks The book illustrates different aspects of the processes used for the production of biofuels dealing specifically with second and third generation feedstocks from biomass and algae The pretreatment of feedstocks and optimization of various forms of bioenergy are considered along with the economic aspects of the various processes In the last few years industrial research efforts have focused on low cost large scale

processing for lignocellulosic feedstocks originating from agricultural residues and municipal wastes for bioenergy production This book shares an insight into the recent developments taking place in this industry exploring transformation processes as well as biomass and algae conversions Reviews existing lignocellulosic biomass feedstocks and their sources Includes processes for the conversion of various feedstocks to biofuels Discusses current research findings on second and third generation feedstocks Describes processes involved in the transformation of algal biomass into biofuels

**Hydrogen Energy** Dilshad Ahmad Khan,Akhilesh Kumar Choudhary,Deepak Sharma,2024-12-18 Since the low energy efficiency and rise in emissions by using fossil fuels the hydrogen economy has been considered as a unique approach to resolve these problems making hydrogen an attractive fuel This book titled Hydrogen Energy Production Storage and Utilization describes various technologies for hydrogen production from different sources and storage in liquid gaseous and compound forms which have also been covered in detail It also highlights the various modes of transportation of hydrogen and its utilization in a variety of engineering applications such as automotive engines fuel cells electric power generation and aerospace The book also explores the safety challenges handling issues and future scope This book Covers the methods of hydrogen production including the bioconversion method Explains the hydrogen storage technologies with proper illustrations Includes engineering and non engineering applications of hydrogen utilization covering the most advanced generation of fuel cells power generation for hybrid vehicles and space applications Presents state of the art research carried out in the domains of hydrogen production storage transportation and utilization along with safety aspects Discusses modes and methods of hydrogen transportation such as in gaseous form liquid form and solid form The book has a wide scope of reaching out to diverse readers including but not limited to industrial engineers process engineers researchers and academicians The research fraternity will gain the benefit of being aware and selecting a similar recent research domain in the field of hydrogen production

**Biomass, Biofuels, Biochemicals** Ashok Pandey,S.Venkata Mohan,Jo-Shu Chang,Patrick C. Hallenbeck,Christian Larroche,2019-01-12 Biomass Biofuels and Biochemical Biohydrogen Second Edition provides general information basic data and knowledge on one of the most promising renewable energy sources including its production and applications The book describes a green technology for abating environmental crisis and enabling the transformation into a sustainable future Researchers students and science enthusiasts alike will appreciate this holistic view of biohydrogen production which details the functional mechanisms employed operational configurations influencing factors and integration strategies With 50% more content this new edition outlines the scaling of processes and features material from experienced international researchers working at the interface of biotechnology and engineering Hydrogen is an energy carrier and is available in chemically combined forms in water fossil fuels and biomass About 95 % of current hydrogen requirements are produced through fossil fuel sources Being a clean energy source its future widespread use as a fuel is likely to be in the transportation and distributed power generation sectors Depicts a holistic view of biohydrogen in a unified approach making

it a single point of reference Includes new technologies and perspectives giving up to date state of the art information on research and commercialization Provides strategic integrations of acidogenesis with various bioprocesses essential in establishing a circular biorefinery Includes new research findings since the 1st edition appeared with 50% more content Integrates various subjects including biotechnology bioengineering molecular biology environmental science etc Reviews the various topics from a global perspective and an international list of contributors *Energy from Microalgae* Eduardo Jacob-Lopes, Leila Queiroz Zepka, Maria Isabel Queiroz, 2018-02-19 This book presents an authoritative and comprehensive overview of the production and use of microalgal biomass and bioproducts for energy generation It also offers extensive information on engineering approaches to energy production such as process integration and process intensification in harnessing energy from microalgae Issues related to the environment food chemicals and energy supply pose serious threats to nations success and stability The challenge to provide for a rapidly growing global population has made it imperative to find new technological routes to increase the production of consumables while also bearing in mind the biosphere s ability to regenerate resources Microbial biomass is a bioresource that provides effective solutions to these challenges Divided into eight parts the book explores microalgal production systems life cycle assessment and the bio economy of biofuels from microalgae process integration and process intensification applied to microalgal biofuels production In addition it discusses the main fuel products obtained from microalgae summarizing a range of useful energy products derived from algae based systems and outlines future developments Given the book s breadth of coverage and extensive bibliography it offers an essential resource for researchers and industry professionals working in renewable energy **Solar-Driven Green Hydrogen Generation and Storage** Rohit Srivastava, Jayeeta Chattopadhyay, Diogo M.F. Santos, 2023-05-18 Solar Driven Green Hydrogen Generation and Storage presents the latest research and technologies in hydrogen generation through solar energy With in depth coverage of three key topics the book discusses green hydrogen technologies solid hydrogen storage and hydrogen energy applications The book begins with a deep dive into photoelectrochemical water splitting examining different catalysts such as perovskite based phosphorene based polymer based transition metal based single atom blue titania carbon based Mxene and semiconductor based catalysts Subsequent chapters analyze hydrogen production techniques including electrolysis photobiological thermochemical and biomass gasification methods After reviewing key hydrogen storage technologies the book concludes with a summary of the applications of hydrogen in various industry sectors This book is an essential resource for students researchers and engineers interested in renewable energy hydrogen production and energy storage Presents the latest advances in hydrogen generation through solar energy Focuses on three key themes green hydrogen technologies solid hydrogen storage and applications of hydrogen energy Considers the major challenges for the hydrogen economy worldwide Microalgal Hydrogen Production Michael Seibert, Giuseppe Torzillo, 2018-03-19 Hydrogen could be the fuel of the future Some microorganisms can produce hydrogen upon illumination Biological methods of

production could be greener than chemical or physical production methods but the potential of biological methods is still being harnessed This comprehensive book highlights the key steps necessary for future exploitation of solar light driven hydrogen production by microalgae The highly regarded editors bring together 46 contributors from key institutions in order to suggest and examine the most significant issues that must be resolved to achieve the goal of practical implementation while proposing reliable methodologies and approaches to solve such issues This 19 chapter book will be an indispensable resource for academics undergraduate and graduate students postgraduates and postdoctoral scholars energy scientists bio chemical engineers and policy makers working across the field of biohydrogen and bioenergy

**Current Trends and Future Developments on (Bio-) Membranes** Angelo Basile,Teko Napporn,2020-03-20 Membrane Systems for Hydrogen Production offers an overview of advanced technologies in the field of both catalysts and membrane technologies for hydrogen productions and energy saving Catalysts play an irreplaceable role in chemical engineering for carrying out reaction at industrial level Membrane processes are today well recognized technologies in many fields such as water and wastewater treatment gas separation and purification etc This book relates these two fields and their role in electrochemical hydrogen production by presenting 5 specific chapters where the catalysts are compared to the membrane technology The purpose of this book is to provide an overview on recently developed catalysts which work in combination with membrane operations for energy savings This combination provides an example of strategies for engineering development and process intensification of interest for both industrial and developing countries Provides an overview of the interconnections between membrane technology and catalysts related to the electrochemical hydrogen production Provides a comprehensive review of advanced research on the catalysts used in electrochemical processes and the use of related membrane processes Addresses the key issues to introduce considerable process intensification in the hydrogen production

**Quorum Sensing and its Biotechnological Applications** Vipin Chandra Kalia,2018-08-11 This book delves into the biotechnological applications of Quorum sensing QS a peculiar gene regulatory process of some microorganisms Quorum Sensing allows a large bacterial population to work together in a coordinated manner to carry out metabolic activities which individual bacterium cannot The different chapters describe how associating bioremediation process with energy generation is an economical proposal for reducing pollution and managing biowastes The book discusses how QS can be exploited for biotechnological applications in generating bioproducts bioenergy bioremediation biosensors health and agricultural activities It further highlights how QS is becoming an integral part of synthetic biology for genetic circuits for producing i novel products ii biosensors iii bioactive molecules etc The book is divided into different sections for a clear understanding of the applicability of QS in the Environment Energy Agriculture and Health sectors

**Photosynthesis in Bryophytes and Early Land Plants** David T. Hanson,Steven K. Rice,2013-10-21 Bryophytes which are important constituents of ecosystems globally and often dominate carbon and water dynamics at high latitudes and elevations were also among the pioneers of terrestrial photosynthesis



Consequently in addition to their present day ecological value modern representatives of these groups contain the legacy of adaptations that led to the greening of Earth This volume brings together experts on bryophyte photosynthesis whose research spans the genome and cell through whole plant and ecosystem function and combines that with historical perspectives on the role of algal bryophyte and vascular plant ancestors on terrestrialization of the Earth The eighteen well illustrated chapters reveal unique physiological approaches to achieving carbon balance and dealing with environmental limitations and stresses that present an alternative yet successful strategy for land plants **A Green Vision Towards a**

**Renewable Energy Future** Suphi S. Oncel,2025-09-26 This 2 volume set provides an overview of the global progress in achieving renewable energy goals through sustainable and economically viable means Volume II covers various potential renewable energy sources such as solar wind hydro and biomass including the technologies associated with each that are economically feasible while still being environmentally sustainable in their implementation This then leads into a discussion of how a transition to a green economy based on renewable energy could be achieved including global opportunities trends policy considerations and societal implications The book will appeal to academics industry professionals and policy makers engaged with the energy economy renewable energy research and environmental sustainability Plant-Based Genetic Tools for Biofuels Production Daniela Defavari do Nascimento,William A. Pickering,2017-06-12 Biofuels are currently used as a viable alternative energy source in several countries Plant Based Genetic Tools for Biofuels Production explains biotechnological techniques and concepts that are applied to increase biofuel yield from plants and algae Chapters of the book cover a variety of topics the basic research techniques cell suspension embryogenesis protoplast fusion plant genetics plant DNA mutations new plant breeding techniques viral genetic vectors for heterologous gene expression sub cellular proteomes genomic resources and bioinformatics tools plant species with bioenergy and biofuel potential factors influencing biomass yield advances in cultivation technologies fermentation of different substrates for ethanol production and microalgae biomass technologies Readers will gain a thorough understanding of modern biofuel production Plant Based Genetic Tools for Biofuels Production is a suitable reference for students in biotechnology and bioinformatics programs as well as researchers interested in information about the basics of biofuel production *Prokaryotes and Evolution* Jean-Claude Bertrand,Philippe Normand,Bernard Ollivier,Télesphore Sime-Ngando,2019-01-01 The purpose of this book is to show the essential and indispensable role of prokaryotes in the evolution of aliving world The evolutionary success of prokaryotes is explained together with their role in the evolution of the geosphere the biosphere and its functioning as well as their ability to colonize all biotopes including the most extreme ones We consider that all past and present living beings emerged from prokaryotes and have interacted with them Forces and mechanisms presented in the various theories of evolution apply to prokaryotes The major stages of their evolution and biodiversity are also described Finally it is emphasized that prokaryotes are living organisms that provide indisputable evidence of evolutionary processes Many examples of ongoing evolution in prokaryotes

observable at the human scale are provided      **Plastid Development in Leaves during Growth and Senescence** Basanti Biswal, Karin Krupinska, Udaya C. Biswal, 2013-07-08 Chloroplast development is a key feature of leaf developmental program Recent advances in plant biology reveal that chloroplasts also determine the development the structure and the physiology of the entire plant The books published thus far have emphasized the biogenesis of the organelle but not the events associated with the transformation of the mature chloroplast to the gerontoplast during senescence This book with 28 chapters is unique because it describes how the chloroplast matures and how it is subsequently transformed to become the gerontoplast during senescence a process required for nutrient recycling in plants This book includes a state of the art survey of the current knowledge on the regulation and the mechanisms of chloroplast development Some of the chapters critically discuss the signaling process the expression potential of plastid DNA the interaction of cellular organelles and the molecular mechanisms associated with the assembly and the disassembly of organellar complexes and finally the modulation of chloroplast development by environmental signals

## Embracing the Song of Expression: An Mental Symphony within **Microbial Bioenergy Hydrogen Production Advances In Photosynthesis And Respiration**

In a global eaten by monitors and the ceaseless chatter of fast connection, the melodic beauty and psychological symphony developed by the published term usually diminish into the background, eclipsed by the constant noise and disturbances that permeate our lives. Nevertheless, situated within the pages of **Microbial Bioenergy Hydrogen Production Advances In Photosynthesis And Respiration** a wonderful literary prize brimming with natural emotions, lies an immersive symphony waiting to be embraced. Crafted by an outstanding musician of language, that fascinating masterpiece conducts readers on an emotional trip, well unraveling the concealed melodies and profound affect resonating within each cautiously constructed phrase. Within the depths with this touching evaluation, we can investigate the book is central harmonies, analyze its enthralling writing type, and submit ourselves to the profound resonance that echoes in the depths of readers souls.

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### **Table of Contents Microbial Bioenergy Hydrogen Production Advances In Photosynthesis And Respiration**

1. Understanding the eBook Microbial Bioenergy Hydrogen Production Advances In Photosynthesis And Respiration
  - The Rise of Digital Reading Microbial Bioenergy Hydrogen Production Advances In Photosynthesis And Respiration
  - Advantages of eBooks Over Traditional Books
2. Identifying Microbial Bioenergy Hydrogen Production Advances In Photosynthesis And Respiration
  - Exploring Different Genres
  - Considering Fiction vs. Non-Fiction
  - Determining Your Reading Goals
3. Choosing the Right eBook Platform
  - Popular eBook Platforms
  - Features to Look for in an Microbial Bioenergy Hydrogen Production Advances In Photosynthesis And Respiration

- User-Friendly Interface
- 4. Exploring eBook Recommendations from Microbial Bioenergy Hydrogen Production Advances In Photosynthesis And Respiration
  - Personalized Recommendations
  - Microbial Bioenergy Hydrogen Production Advances In Photosynthesis And Respiration User Reviews and Ratings
  - Microbial Bioenergy Hydrogen Production Advances In Photosynthesis And Respiration and Bestseller Lists
- 5. Accessing Microbial Bioenergy Hydrogen Production Advances In Photosynthesis And Respiration Free and Paid eBooks
  - Microbial Bioenergy Hydrogen Production Advances In Photosynthesis And Respiration Public Domain eBooks
  - Microbial Bioenergy Hydrogen Production Advances In Photosynthesis And Respiration eBook Subscription Services
  - Microbial Bioenergy Hydrogen Production Advances In Photosynthesis And Respiration Budget-Friendly Options
- 6. Navigating Microbial Bioenergy Hydrogen Production Advances In Photosynthesis And Respiration eBook Formats
  - ePub, PDF, MOBI, and More
  - Microbial Bioenergy Hydrogen Production Advances In Photosynthesis And Respiration Compatibility with Devices
  - Microbial Bioenergy Hydrogen Production Advances In Photosynthesis And Respiration Enhanced eBook Features
- 7. Enhancing Your Reading Experience
  - Adjustable Fonts and Text Sizes of Microbial Bioenergy Hydrogen Production Advances In Photosynthesis And Respiration
  - Highlighting and Note-Taking Microbial Bioenergy Hydrogen Production Advances In Photosynthesis And Respiration
  - Interactive Elements Microbial Bioenergy Hydrogen Production Advances In Photosynthesis And Respiration
- 8. Staying Engaged with Microbial Bioenergy Hydrogen Production Advances In Photosynthesis And Respiration
  - Joining Online Reading Communities
  - Participating in Virtual Book Clubs
  - Following Authors and Publishers Microbial Bioenergy Hydrogen Production Advances In Photosynthesis And Respiration

9. Balancing eBooks and Physical Books Microbial Bioenergy Hydrogen Production Advances In Photosynthesis And Respiration
  - Benefits of a Digital Library
  - Creating a Diverse Reading Collection Microbial Bioenergy Hydrogen Production Advances In Photosynthesis And Respiration
10. Overcoming Reading Challenges
  - Dealing with Digital Eye Strain
  - Minimizing Distractions
  - Managing Screen Time
11. Cultivating a Reading Routine Microbial Bioenergy Hydrogen Production Advances In Photosynthesis And Respiration
  - Setting Reading Goals Microbial Bioenergy Hydrogen Production Advances In Photosynthesis And Respiration
  - Carving Out Dedicated Reading Time
12. Sourcing Reliable Information of Microbial Bioenergy Hydrogen Production Advances In Photosynthesis And Respiration
  - Fact-Checking eBook Content of Microbial Bioenergy Hydrogen Production Advances In Photosynthesis And Respiration
  - Distinguishing Credible Sources
13. Promoting Lifelong Learning
  - Utilizing eBooks for Skill Development
  - Exploring Educational eBooks
14. Embracing eBook Trends
  - Integration of Multimedia Elements
  - Interactive and Gamified eBooks

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