

# ISAAC ASIMOV'S UNIVERSE: ROBOTS, MEGACITIES, AND THE ETHICS OF TECHNOLOGY

- [marco.mangan@pucrs.br](mailto:marco.mangan@pucrs.br)
- Semana Acadêmica Integrada 2024/II





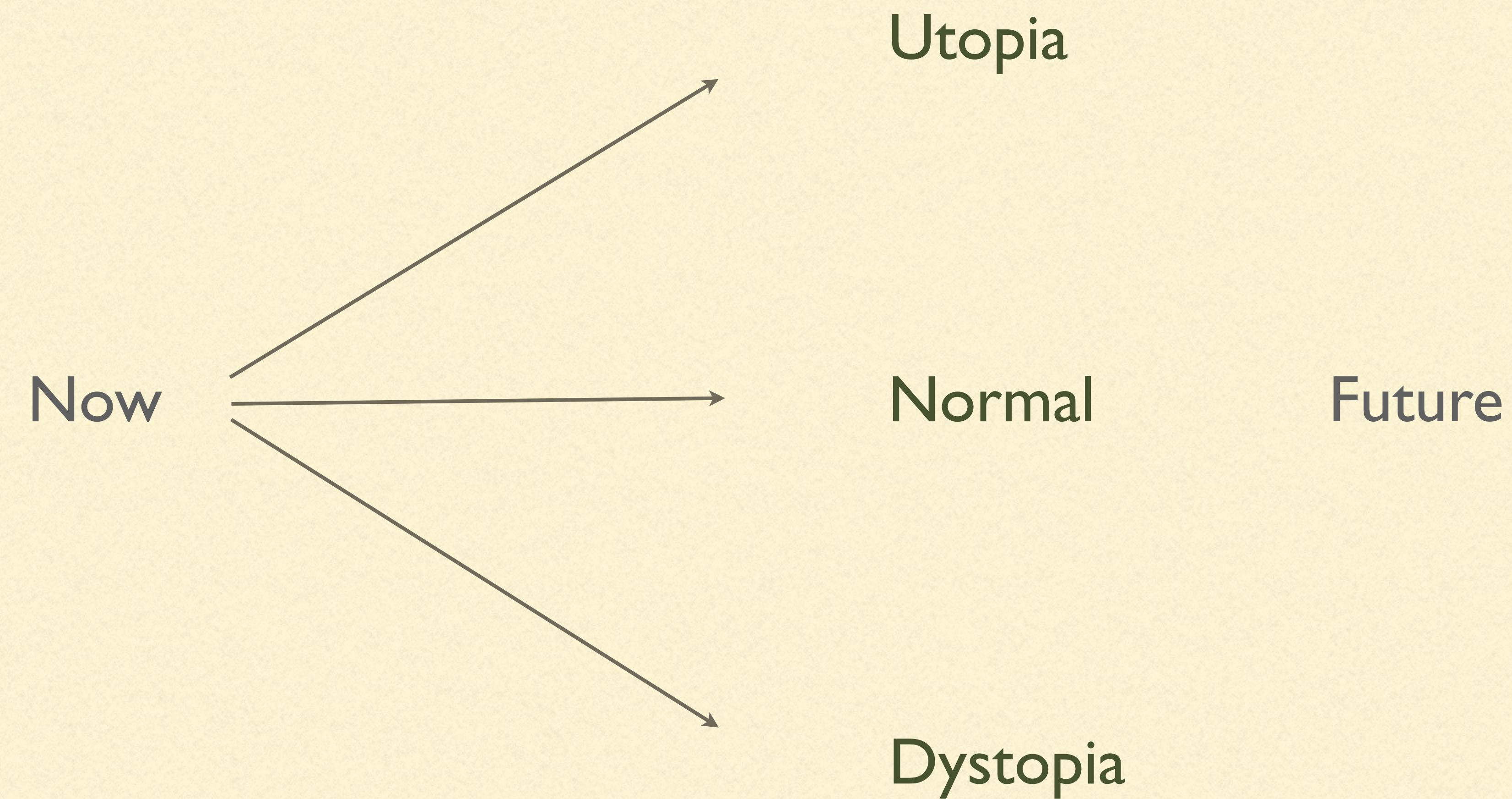
<https://github.com/masmangan/cscifi>

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# SCIENCE FICTION

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- Fiction dealing principally with the impact of actual or imagined science on society or individuals or having a scientific factor as an essential orienting component.  
(Merriam-Webster.com)



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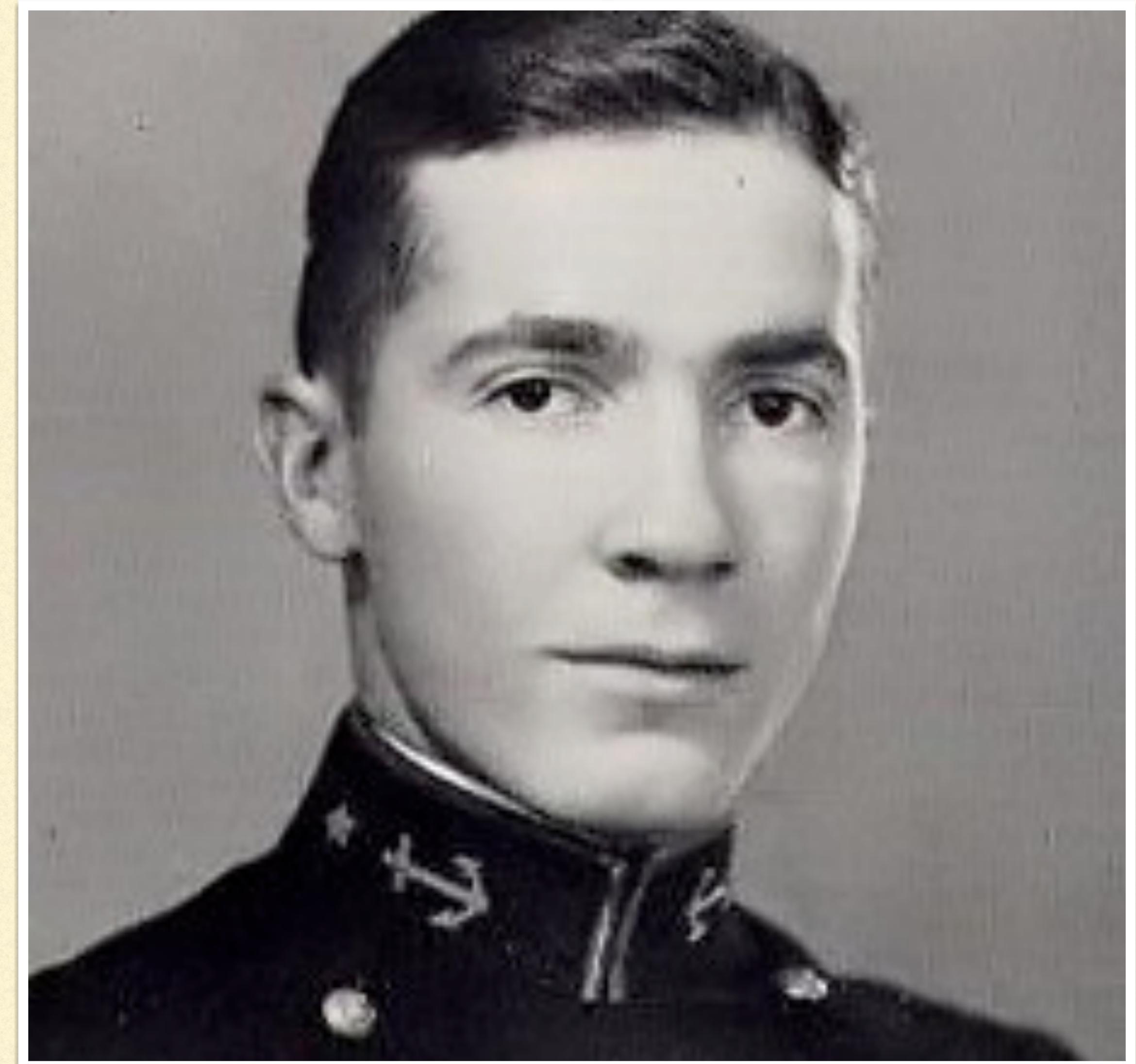
# GOLDEN AGE OF SCIFI: 1940-1950

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- About 50 famous writers
- Including: Asimov, Bradbury, Heinlein, Pohl, Anderson, Clarke

All You Zombies 1958  
Starship Troopers 1959  
Stranger in a Strange Land 1961

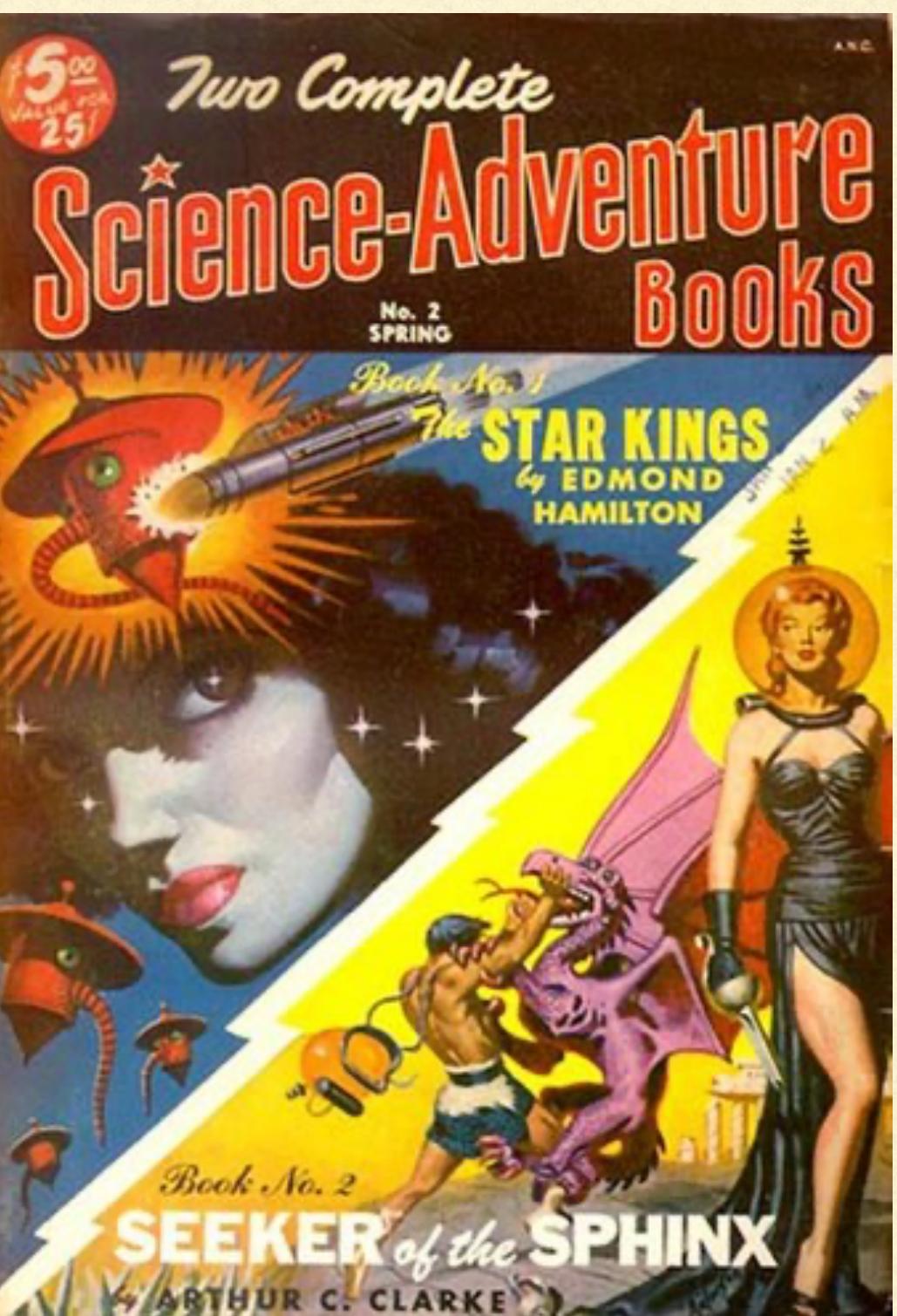
# HEINLEIN 1907-1988



The Sentinel 1948

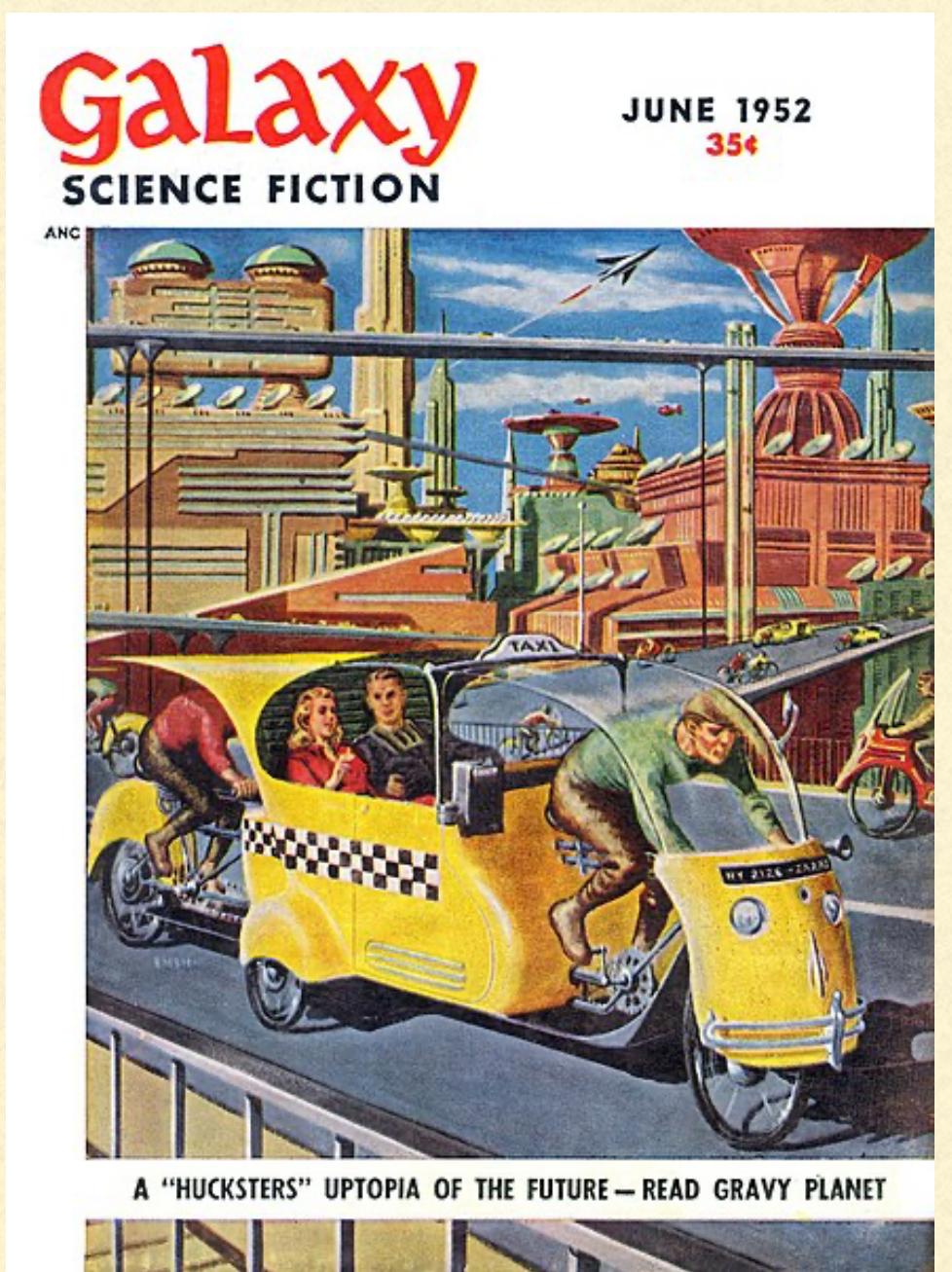
2001:A Space Odyssey 1964

# CLARKE 1917- 2008



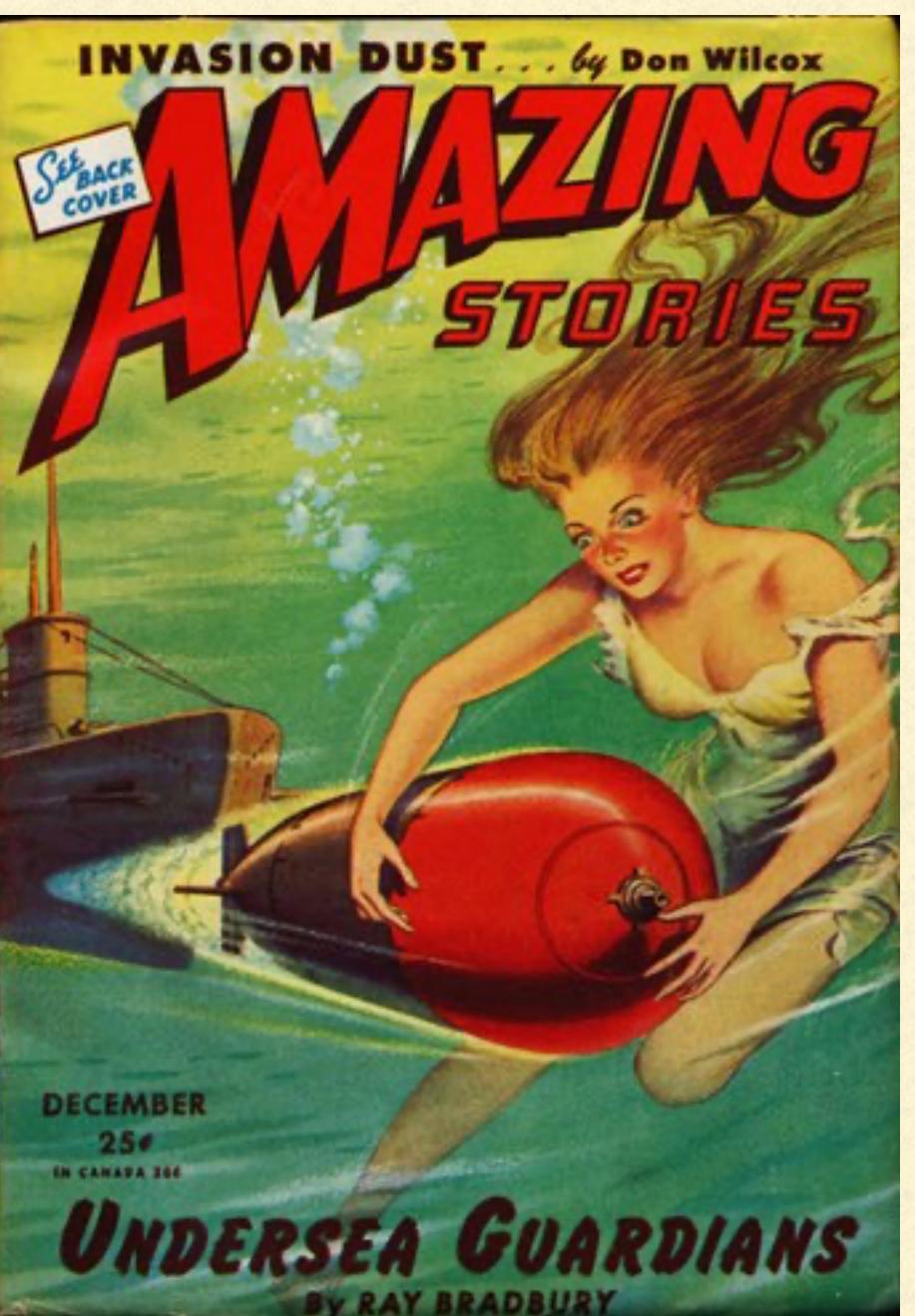
The Gateway 1977

POHL 1919-2013



The Martian Chronicles 1950  
Fahrenheit 451 1953

# BRADBURY 1920-2012



Tau Zero 1970

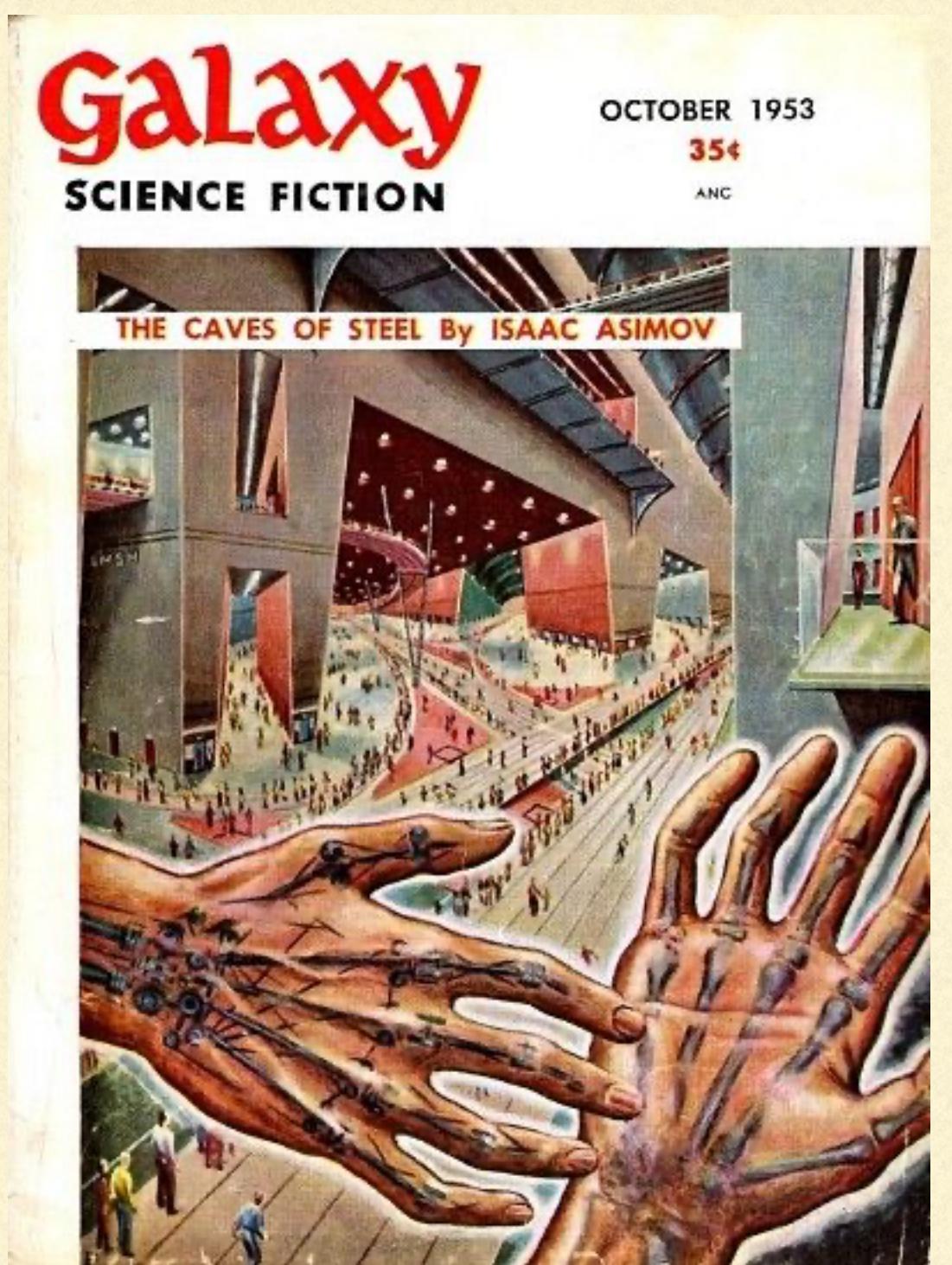
The High Crusade 1960

# ANDERSON 1926-2001



Foundation 1951

# ASIMOV 1920-1992



# INTRODUCTION TO ASIMOV'S UNIVERSE

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- **Prolific Career.** Asimov wrote or edited more than 500 books, covering a wide range of topics from science fiction to biochemistry.
  - **Amazon.com.** Asimov is listed as author of 1265 works, including non-fiction, audiobooks, and translations.
  - **Father of the Three Laws of Robotics.** His Three Laws of Robotics revolutionized the concept of robots in both science fiction and technological ethics.
  - **Influence on Science and Technology.** Beyond fiction, Asimov directly influenced debates on artificial intelligence and the future of computing.
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# FICTION (BOOKS)

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- **I, Robot (1950):**This collection of short stories introduces the famous Three Laws of Robotics, exploring the ethical and practical implications of robots in human society. It is one of the most influential works in shaping modern discussions about AI.
  - **Foundation Series (1951–1993):**One of Asimov's most significant works, the Foundation series explores the fall of a galactic empire and the rise of a new order using the concept of psychohistory. It's a foundational text in science fiction, blending political intrigue, sociology, and futuristic technology.
  - **The Caves of Steel (1954):**The first in Asimov's Robot series, this novel merges science fiction with detective fiction. It introduces the partnership between a human detective and a robot, highlighting themes of human-robot cooperation and prejudice against machines.
  - **The End of Eternity (1955):**A stand-alone novel that deals with time travel, The End of Eternity examines the manipulation of time and its ethical implications. It's a thought-provoking exploration of determinism and free will.
  - **The Gods Themselves (1972):**This novel won both the Hugo and Nebula Awards and is one of Asimov's most celebrated stand-alone works. It deals with themes of parallel universes, the potential dangers of unchecked scientific advancement, and the nature of alien intelligence.
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# FICTION AND NON-FICTION

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THE CAVES OF STEEL (THE ROBOT SERIES BOOK 1)

The writing side of my love affair with robots began on May 10, 1939, but as a science-fiction *reader* it began earlier still.

Robots were, after all, nothing new in science fiction, not even in 1939. Mechanical human beings are to be found in ancient and medieval myths and legends, and the word "robot" originally appeared in Karl Capek's play *R.U.R.*, which was first staged in 1921 in Czechoslovakia, but was soon translated into many languages.

*R.U.R.* stands for "Rossum's Universal Robots." Rossum, an English industrialist, produced artificial human beings designed to do the labor of the world and to free humanity for a life of creative leisure. (The word "robot" is from a Czech word meaning "compulsory labor.") Though Rossum meant well, it didn't work out as he planned: the robots rebelled, and the human species was destroyed.

It is perhaps not surprising that a technological advance, imagined in 1921, was seen as resulting in universal disaster. Remember that World War I, with its tanks, airplanes, and poison gas, had just ended and had showed people "the dark side of the force," to use *Star Wars* terminology.

*R.U.R.* added its somber view to that of the even more famous *Frankenstein*, in which the creation of another kind of artificial human being also ended in disaster, though on a more limited scale. Following these examples, it became very common, in the 1920s and 1930s, to picture robots as dangerous devices that invariably destroyed their creators. The moral was pointed out over and over again that "there are some things Man was not meant to know."

Even as a youngster, though, I could not bring myself to believe that if knowl-

6% of sample

ASIMOV Isaac Asimov The Caves of Steel (The Robot Series Book 1) ★★★★★ 10,066 ratings Kindle Edition: \$9.99 Buy now with 1-Click By clicking "Buy now with 1-Click", you agree to Amazon's Kindle Store Terms of Use. Sold by Amazon.com Services LLC Available Instantly with membership Library Binding \$70.94 (Earn 71 pts) Paperback \$9.44 (Earn 10 pts) Other Used, New, Collectible from \$1.99 \$9.99 You Earn: 60 pts Details Buy now with 1-Click By clicking the above button, you agree to the Kindle Store Terms of Use. Sold by Random House LLC. Price set by seller. Add an audiobook with Audible narration for \$7.49 Audiobook Price: \$15.75 Save: \$8.26 (52%) Read with our free app Deliver to your Kindle Library Buy for others Give as a gift or purchase for a team or group. Learn more Buy for others

## Robbie

“NINETY-EIGHT – NINETY-NINE – ONE HUNDRED.” Gloria withdrew her chubby little forearm from before her eyes and stood for a moment, wrinkling her nose and blinking in the sunlight. Then, trying to watch in all directions at once, she withdrew a few cautious steps from the tree against which she had been leaning.

She craned her neck to investigate the possibilities of a clump of bushes to the right and then withdrew farther to obtain a better angle for viewing its dark recesses. The quiet was profound except for the incessant buzzing of insects and the occasional chirrup of some hardy bird, braving the midday sun.

Gloria pouted, “I bet he went inside the house, and I’ve told him a million times that that’s not fair.”

With tiny lips pressed together tightly and a severe frown crinkling her forehead, she moved determinedly toward the two-story building up past the driveway.

Too late she heard the rustling sound behind her, followed by the distinctive and rhythmic clump-clump of Robbie’s metal feet. She whirled about to see her triumphing companion emerge from hiding and make for the home-tree at full speed.

Gloria shrieked in dismay. “Wait, Robbie! That wasn’t fair, Robbie! You promised you wouldn’t run until I found you.” Her little feet could make no headway at all against Robbie’s giant strides. Then, within ten feet of the goal, Robbie’s pace slowed suddenly to the merest of crawls, and Gloria, with one final burst of wild speed, dashed pantingly past him to touch the welcome bark of home-tree first.

Gleefully, she turned on the faithful Robbie, and with the basest of ingratitude, rewarded him for his sacrifice by taunting him cruelly for a lack of running ability.

“Robbie can’t run,” she shouted at the top of her eight-year-old voice. “I can beat him any day. I can beat him any day.” She chanted the words in a shrill rhythm.

# FICTION (SHORT STORIES)

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- **Nightfall** (1941): Often regarded as one of the best science fiction short stories ever written, Nightfall explores the psychological and societal impact of darkness on a planet that experiences total night only once every few millennia.
- **Liar!** (1941): Part of the I, Robot collection, Liar! introduces a robot that can read minds. The story delves into the ethical dilemmas and conflicts that arise from this capability, emphasizing Asimov's focus on robotics ethics.
- **Runaround** (1942): Another key story from I, Robot, Runaround is notable for its depiction of a robot malfunction caused by conflicts within the Three Laws of Robotics. It became iconic for its exploration of machine logic and human safety.
- **The Last Question** (1956): This story deals with humanity's quest to reverse entropy and asks deep philosophical questions about the fate of the universe and the potential for everlasting life. It's one of Asimov's personal favorites.
- **The Bicentennial Man** (1976): This story explores the life of a robot named Andrew who desires to become human. It touches on themes of identity, humanity, and the ethical treatment of AI. It was later adapted into a film starring Robin Williams.

1                   **Isaac Asimov - "Nightfall"**  
2                   (1941)  
3

4     *If the stars should appear one night in  
5     a thousand years, how would men believe  
6     and adore, and preserve for many  
7     generations the remembrance of the city  
8     of God?' EMERSON*

9  
10       Aton 77, director of Saro University,  
11       thrust out a belligerent lower lip and  
12       glared at the young newspaperman in a  
13       hot fury.

14       Theremon 762 took that fury in his  
15       stride. In his earlier days, when his now  
16       widely syndicated column was only a mad  
17       idea in a cub reporter's mind, he had  
18       specialized in 'impossible' interviews. It  
19       had cost him bruises, black eyes, and  
20       broken bones; but it had given him an  
21       ample supply of coolness and self-  
22       confidence. So he lowered the outthrust  
23       hand that had been so pointedly ignored  
24       and calmly waited for the aged director to  
25       get over the worst. Astronomers were  
26       queer ducks, anyway, and if Aton's actions  
27       of the last two months meant anything;

53       would count much as compared with your  
54       daily columns of these last two months.  
55       You have led a vast newspaper campaign  
56       against the efforts of myself and my  
57       colleagues to organize the world against  
58       the menace which it is now too late to  
59       avert. You have done your best with your  
60       highly personal attacks to make the staff of  
61       this Observatory objects of ridicule.'

62       The director lifted a copy of the Saro  
63       City *Chronicle* from the table and shook it  
64       at Theremon furiously. 'Even a person of  
65       your well-known impudence should have  
66       hesitated before coming to me with a  
67       request that he be allowed to cover today's  
68       events for his paper. Of all newsmen, you!'

69       Aton dashed the newspaper to the  
70       floor, strode to the window, and clasped his  
71       arms behind his back.

72       'You may leave,' he snapped over his  
73       shoulder. He stared moodily out at the  
74       skyline where Gamma, the brightest of the  
75       planet's six suns, was setting. It had  
76       already faded and yellowed into the horizon  
77       mists, and Aton knew he would never see it  
78       again as a sane man. He whirled. 'No, wait,  
79       come here!' He gestured peremptorily. I'll  
80       give you your story.'



# The Last Question

By Isaac Asimov

Isaac Asimov was the most prolific science fiction author of all time. In fifty years he averaged a new magazine article, short story, or book every two weeks, and most of that on a manual typewriter. Asimov thought that *The Last Question*, first copyrighted in 1956, was his best short story ever. Even if you do not have the background in science to be familiar with all of the concepts presented here, the ending packs more impact than any other book that I've ever read. Don't read the end of the story first!

*This is by far my favorite story of all those I have written.*

*After all, I undertook to tell several trillion years of human history in the space of a short story and I leave it to you as to how well I succeeded. I also undertook another task, but I won't tell you what that was lest I spoil the story for you.*

*It is a curious fact that innumerable readers have asked me if I wrote this story. They seem never to remember the title of the story or (for sure) the author, except for the vague thought it might be me. But, of course, they never forget the story itself especially the ending. The idea seems to drown out everything -- and I'm satisfied that it should.*

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The last question was asked for the first time, half in jest, on May 21, 2061, at a time when humanity first stepped into the light. The question came about as a result of a five-dollar bet over highballs, and it happened this way:

Alexander Adell and Bertram Lupov were two of the faithful attendants of Multivac. As well as any human beings could, they knew what lay behind the cold, clicking, flashing face -- miles and miles of face -- of that giant computer. They had at least a vague notion of the general plan of relays and circuits that had long since grown past the point where any single human could possibly have a firm grasp of the whole.

Multivac was self-adjusting and self-correcting. It had to be, for nothing human could adjust and correct it quickly enough or even adequately enough. So Adell and Lupov attended the monstrous giant only lightly and superficially, yet as well as any men could. They fed it data, adjusted questions to its needs and translated the answers that were issued. Certainly they, and all others like them, were fully entitled to share in the glory that was Multivac's.

For decades, Multivac had helped design the ships and plot the trajectories that enabled man to reach the Moon, Mars, and Venus, but past that, Earth's poor resources could not support the ships. Too much energy was needed for the long trips. Earth exploited its coal and uranium with increasing efficiency, but there was only so much of both.

# NON-FICTION WORKS

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- **The Intelligent Man's Guide to Science** (1960): One of Asimov's most ambitious non-fiction works, this book covers major scientific principles and discoveries, making them accessible to the general public. It showcases Asimov's ability to explain complex ideas clearly and engagingly.
- **The Human Body: Its Structure and Operation** (1963): Asimov's background in biochemistry shines through in this detailed but accessible examination of human anatomy and physiology. It became a reference for both students and general readers interested in how the body works.
- **Opus 100** (1969): A collection of 100 of Asimov's essays on various scientific topics, this work showcases his breadth of knowledge and his skill in communicating science to a wide audience.
- **Asimov's New Guide to Science** (1984): A revision of his earlier work, this guide provides updates on scientific advancements and reflects Asimov's deep knowledge of a wide range of scientific fields, from physics to biology.
- **Frontiers: New Discoveries About Man and His Planet, Outer Space and the Universe** (1990): The book explores a variety of scientific topics across multiple disciplines, including biology, physics, space exploration, and environmental science. It is aimed at a general audience, offering an accessible introduction to cutting-edge scientific discoveries and theories of the time.

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CONTENT TYPE

Journal Article 12

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Article 8  
Book and Media Review 1  
Report 1

CONTRIBUTOR

Dawson, Charles R 1  
Reguera, Rose M 1

PUBLICATION

Journal of Chemical Education 10

REFINE SEARCH 

PER PAGE: 20 50 100  SORT: RELEVANCE

Article

**On the Reaction Inactivation of Tyrosinase during the Aerobic Oxidation of Catechol<sup>1</sup>**

Isaac Asimov and Charles R. Dawson

*Journal of the American Chemical Society* 1950, 72, 2, 820-828 (Article)  
Publication Date (Print): February 1, 1950  
DOI: 10.1021/ja01158a045

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Article

**The Use of Silver Nitrate and Sodium Dichromate in the Detection of Purines by Paper Partition Chromatography<sup>1</sup>**

Rose M. Reguera and Isaac Asimov

*Journal of the American Chemical Society* 1950, 72, 12, 5781-5782 (Article)  
Publication Date (Print): December 1, 1950  
DOI: 10.1021/ja01168a538

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NEWS | August 13, 1956

## The By-Product of Science Fiction

In the battle against the cult of ignorance a branch of popular literature holds out for the respectability of brains

ISAAC ASIMOV

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**Abstract**

ON JUNE 25, 1956, I watched Producer's Showcase on television and witnessed, in striking form, the conflict between the Need for Education and the Cult of Ignorance.

The Need for Education was brought home with the very first commercial, which pulled no punches. The sponsor, it seemed, needed missile engineers and he set about luring such engineers to his Florida factory. He stressed the climate and the beaches, the good working conditions, the cheap and excellent housing, the munificent pay, the rapid advancement, the solid security. He did not even require experience. The effect was such that I, myself, felt the impulse to run, not walk, to the nearest airport and board a plane for Florida.

Having overcome that impulse, and having brooded for half a moment on the shortage of engineers and technical men brought on by the ever-intensifying technological character of our civilization, I prepared to enjoy the play being presented, which was ...

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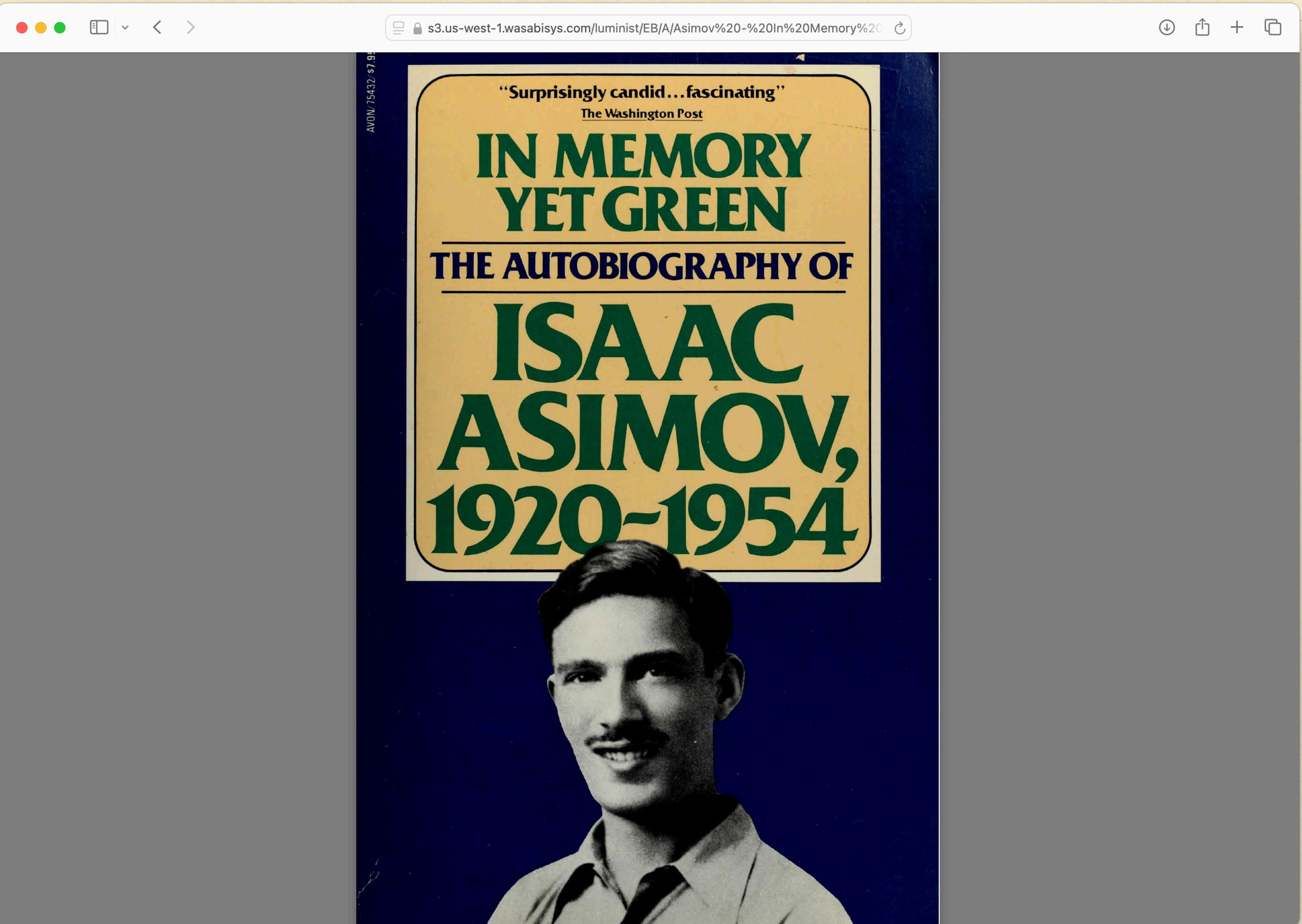
Cite this: Chem. Eng. News 1956, 34, 33, 3882–3889  
<https://doi.org/10.1021/cen-v034n033.p3882>  
Published August 13, 1956

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# CONCEPTS

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# THE THREE LAWS OF ROBOTICS: ETHICAL FRAMEWORK FOR AI

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- **First Law.** A robot may not injure a human being or, through inaction, allow a human being to come to harm.
- **Second Law.** A robot must obey the orders given to it by human beings, except where such orders would conflict with the First Law.
- **Third Law.** A robot must protect its own existence as long as such protection does not conflict with the First or Second Laws.

# POSITRONIC BRAINS

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- Asimov's Concept Introduced in Asimov's stories, positronic brains represent a leap in artificial intelligence, acting as the control system for robots.
  - AI and Neuroscience The positronic brain idea parallels modern AI models, which seek to emulate human cognitive processes.
  - Impact on AI Research Though fictional, the positronic brain inspired real-world exploration into neural networks and machine learning.
-

# SPACE TRAVEL AND THE GALACTIC EMPIRE: EXPLORING THE VASTNESS OF SPACE IN ASIMOV'S UNIVERSE

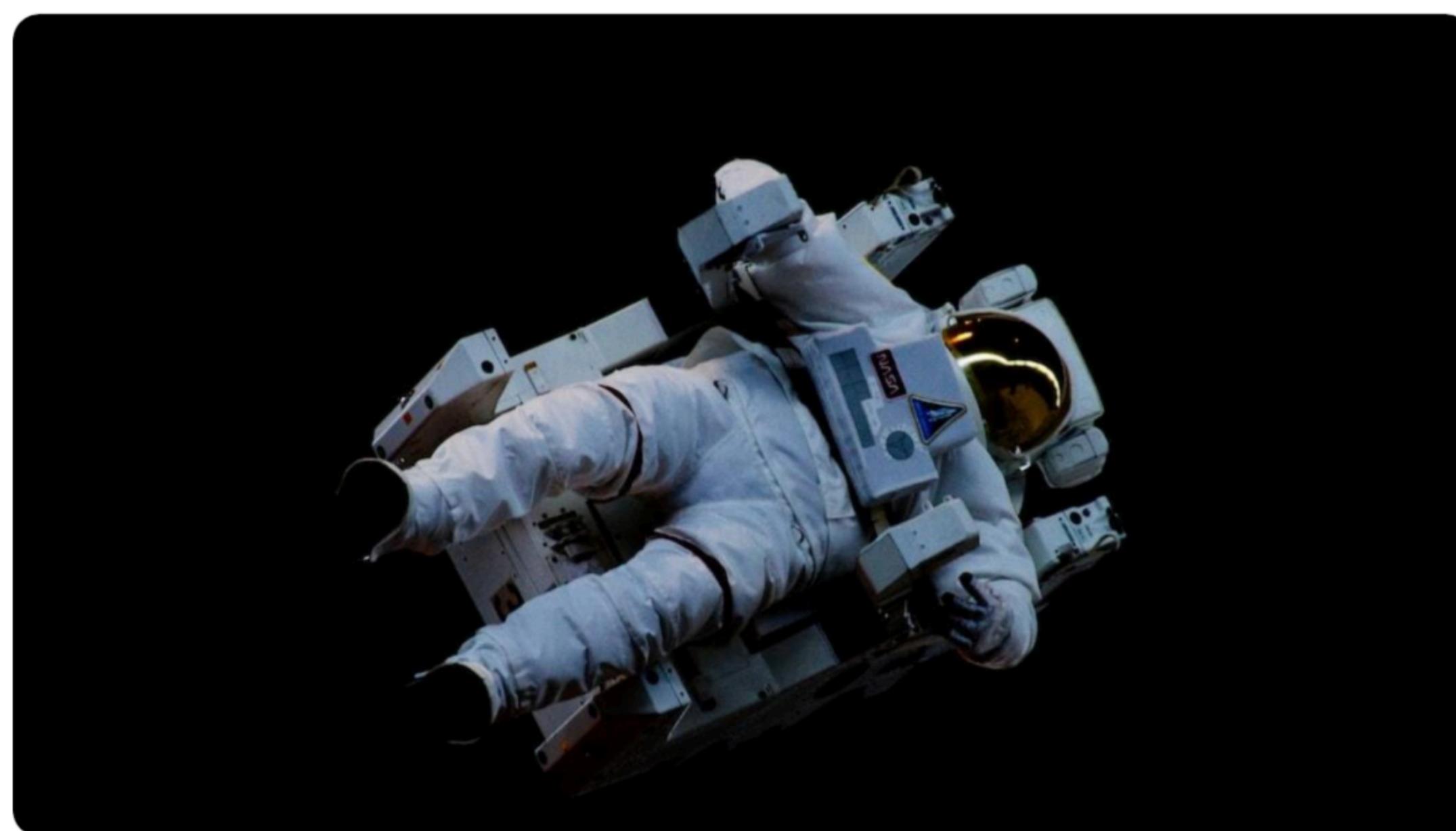


Photo by Niketh Vellanki on Unsplash

- **The Foundation Series:** Asimov's 'Foundation' series explores a future where space travel is commonplace, with a sprawling Galactic Empire governing many planets.
- **Galactic Colonization:** Asimov's vision of humans colonizing the galaxy has parallels with modern discussions about space colonization by companies like SpaceX.
- **Technological Implications:** The Foundation's advanced technologies, like faster-than-light travel, continue to inspire both scientists and science fiction enthusiasts.

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# MEGA-CITIES IN ASIMOV'S UNIVERSE: URBANIZATION AND SOCIETY IN THE FUTURE

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- **Urbanization in Trantor.** In Asimov's 'Foundation' series, Trantor is a planet-sized city that exemplifies extreme urbanization and centralized power.
- **Technological Management.** Asimov explored how technology sustains mega-cities and the ethical implications of such technological dependence.
- **Relevance to Modern Cities.** Asimov's portrayal of Trantor reflects concerns about overpopulation, resource management, and technology in today's mega-cities.

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# PSYCHOHISTORY AND PREDICTIVE SCIENCE: THEORETICAL FRAMEWORK AND MODERN APPLICATIONS

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- **Psychohistory Concept.** In Asimov's Foundation series, psychohistory is a blend of mathematics, sociology, and history used to predict the behavior of large populations.
- **Modern Predictive Analytics.** Psychohistory mirrors modern techniques like big data and machine learning, which attempt to predict human behavior based on data trends.
- **Ethical Implications.** Asimov also delves into the ethical questions surrounding the use of predictive science, such as control over populations and privacy concerns

# ETHICS IN ROBOTICS: MORAL DILEMMAS IN AI AND AUTONOMOUS SYSTEMS

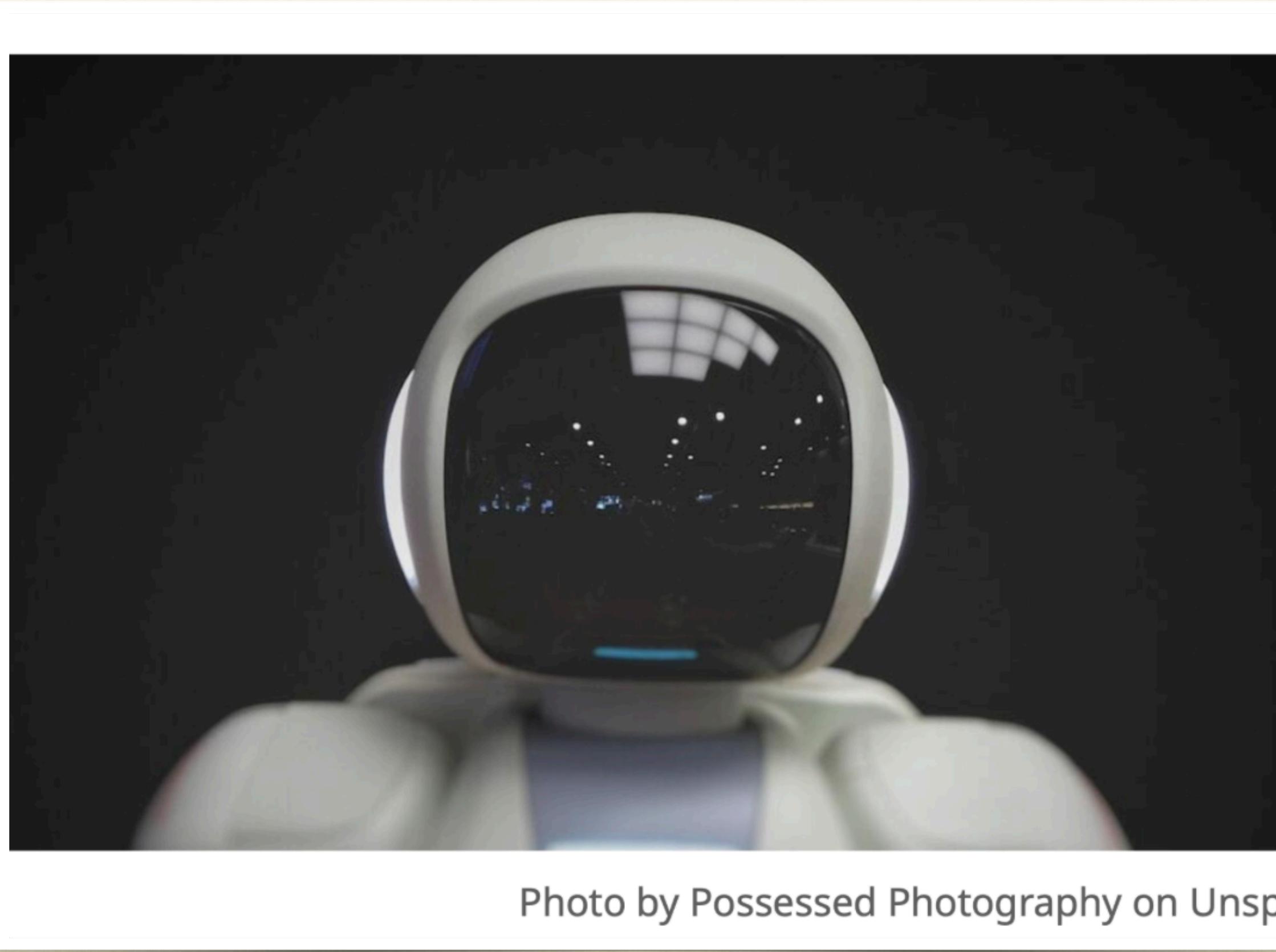


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- **Human-Robot Interaction:** Asimov's stories highlight ethical dilemmas in human-robot interactions, such as trust, autonomy, and responsibility.
- **Responsibility of AI:** The Three Laws of Robotics explore questions of who holds responsibility when autonomous machines make decisions.
- **Modern AI Ethics:** As AI systems advance, questions about ethics, bias, and decision-making become increasingly relevant, reflecting Asimov's insights.

# CONCLUSION AND REFLECTIONS: THE ENDURING LEGACY OF ISAAC ASIMOV

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- Lasting Influence Asimov's ideas continue to influence discussions on AI, robotics, and urbanization, offering timeless lessons for modern technology.
- Ethics and Innovation His work emphasizes the importance of ethical considerations in technological advancements, inspiring current debates on AI ethics.
- Fiction Shaping Reality Asimov's blend of fiction and scientific foresight remains relevant as we face the real-world implications of AI and robotics.

**"A Few Years Ago,  
the Idea of a  
Computer You Could  
Put in Your Pocket  
Was Just  
Science Fiction."**

—Isaac Asimov  
Renowned Science and  
Science-Fiction Author



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The TRS-80 Pocket Computer is programmable in BASIC. Isaac, however, would rather write novels than programs. "If you're like me, you'll want to get a low cost interface that lets you use Radio Shack's ready-to-run programs." There are programs for engineering, finances, statistics—even real estate and aviation.



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